States
Department
of Agriculture

Forest Service

Washington, D.C.

Report of the Forest Service

Fiscal Year 1989

The Forest Service

The Forest Service, U.S.Department of Agriculture, is responsible for Federal leadership in Forestry. It carries out this role through four main activities:

- Protection and management of resources on 191 million acres of National Forest System lands.
- Research on all aspects of forestry, rangeland management, and forest resources utilization.
- Cooperation with State and local governments, forest industries, and private landowners to help protect and manage non-Federal forest and associated range and watershed lands.
- Participation with other agencies in human resource and community assistance programs to improve living conditions in rural areas.

1989 STATISTICS

Receipts	$1.84 Billion
Expenditures	$3.19 Billion
Permanent Full-time Employees	30,500
Woodland Owners Assisted	153,855
National Forest System Lands Burned	0.4 Million Acres
Research Publications	2,078
Human Resource Programs	95,608 Persons Served
National Forest System	191 Million Acres
Wilderness	32.5 Million Acres
Road System	360,000 Miles
Trail System	108,381 Miles
Recreation Use	252.5 Million Visitor Days
Timber Sold	8.4 Billion Board Feet
Grazing Permits Administered	11,983
Wildlife and Fish Habitat Improvements	462,701 Acres
Livestock Grazing	9.6 Million Animal Unit Months
Mineral Cases Processed	29,152
Insect and Disease Suppression	1.1 Million Acres
Reforestation	475.9 Thousand Acres
Timber Harvested	12.0 Billion Board Feet
National Wild and Scenic Rivers System	3,338 Miles
National Scenic Byways	2,937 Miles
Watershed Improvements	39,190 Acres

United States
Department of
Agriculture

Forest Service
Washington, D.C.

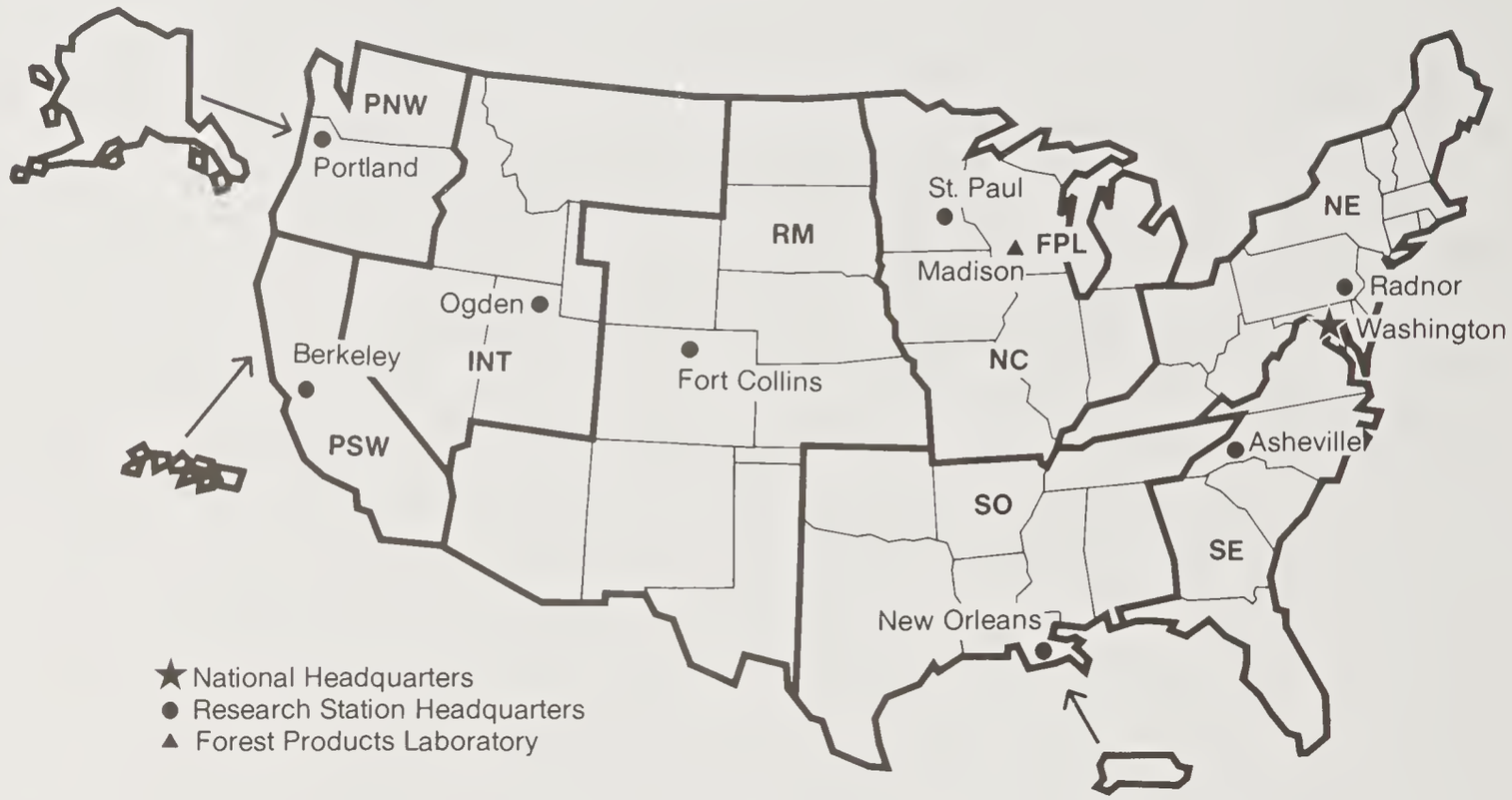
February 1990

Report of the Forest Service

Fiscal Year 1989

Forest Service
U.S. Department of Agriculture

Research



National Headquarters

Send all mail except Express Mail to this address:
Forest Service—USDA
P.O. Box 96090
Washington, DC 20090-6090
202-447-3957

Send Express Mail to this address:
Chief, Forest Service
U.S. Department of Agriculture
South Bldg., 12th & Independence Ave., S.W.
Washington, DC 20250

Research Station Headquarters

Intermountain Forest and Range Experiment Station (INT)
Federal Building
324 25th Street
Ogden, UT 84401
801-625-5412

North Central Forest Experiment Station (NC)
1992 Folwell Avenue
St. Paul, MN 55108
612-649-5000

Northeastern Forest Experiment Station (NE)
100 Matsonford Rd. - Suite 200
Radnor, PA 19087
215-975-4111

Pacific Northwest Forest and Range Experiment Station (PNW)
P.O. Box 3890
Portland, OR 97208
503-326-5640

Pacific Southwest Forest and Range Experiment Station (PSW)
1960 Addison Street
P.O. Box 245, (94701)
Berkeley, CA 94704
415-486-3292

Rocky Mountain Forest and Range Experiment Station (RM)
240 West Prospect Road
Fort Collins, CO 80526-2098
303-498-1100

Southeastern Forest Experiment Station (SE)
200 Weaver Blvd.
P.O. Box 2680
Asheville, NC 28802
704-257-4390

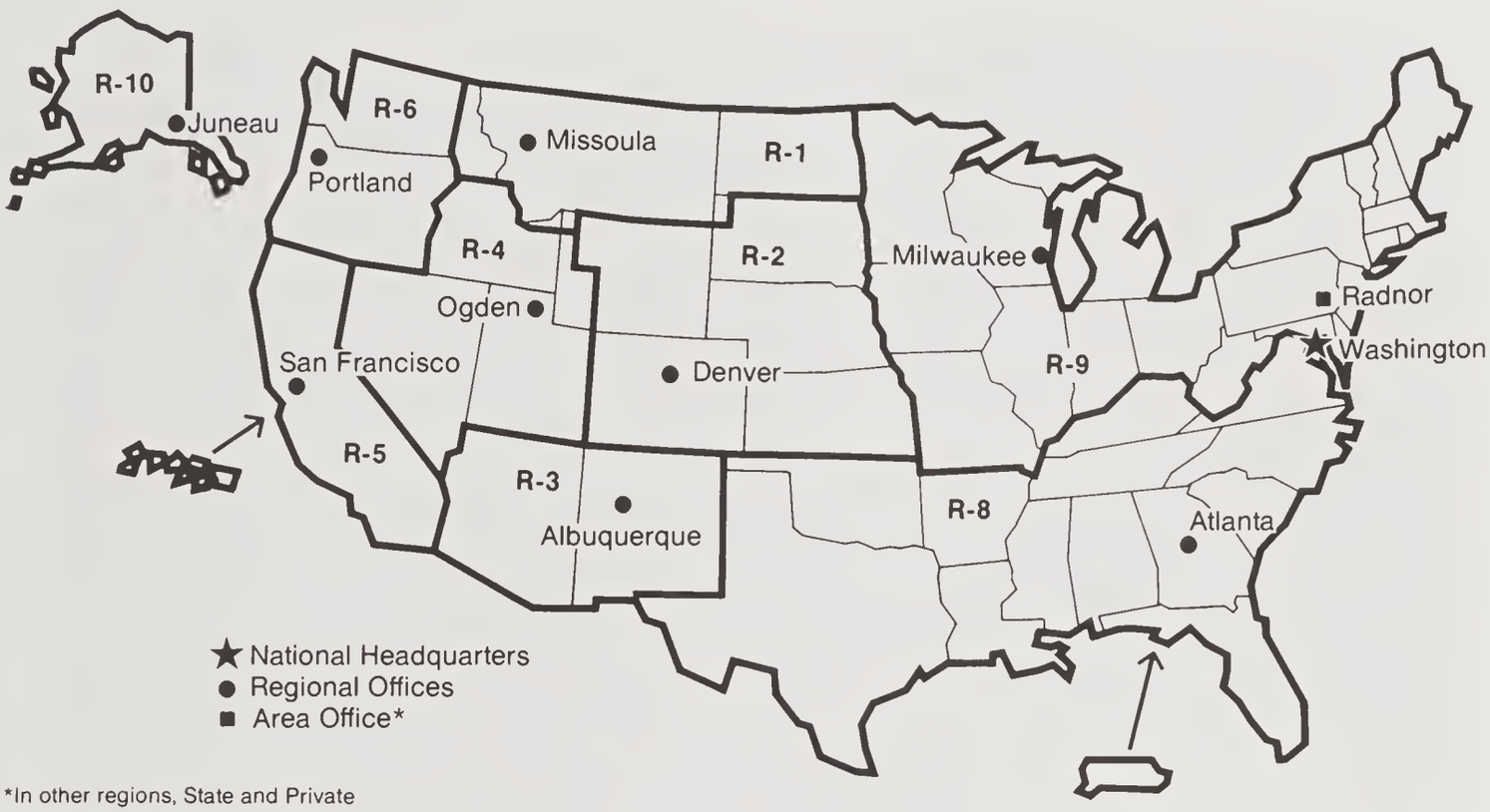
Southern Forest Experiment Station (SO)
Room T-10210
U.S. Postal Service Building
701 Loyola Avenue
New Orleans, LA 70113
504-589-6800

Forest Products Laboratory (FPL)

One Gifford Pinchot Drive
Madison, WI 53705-2398
608-264-5600

Forest Service
U.S. Department of Agriculture

National Forest System Regional Offices
State and Private Forestry Area Office*



*In other regions, State and Private Forestry activities are directed from Regional Offices.

Regional Offices

Forest Service, USDA
Northern Region, (R-1)
Federal Building
P.O. Box 7669
Missoula, MT 59807
406-329-3511

Forest Service, USDA
Rocky Mountain Region (R-2)
11177 West 8th Avenue
P.O. Box 25127
Lakewood, CO 80225
303-236-9431

Forest Service, USDA
Southwestern Region (R-3)
Federal Building
517 Gold Avenue, S.W.
Albuquerque, NM 87102
505-842-3292

Forest Service, USDA
Intermountain Region (R-4)
Federal Building
324 25th Street
Ogden, UT 84401
801-625-5352

Forest Service, USDA
Pacific Southwest Region (R-5)
630 Sansome Street
San Francisco, CA 94111
415-556-0122

Forest Service, USDA
Pacific Northwest Region (R-6)
319 S.W. Pine Street
P.O. Box 3623
Portland, OR 97208
503-326-2877

Forest Service, USDA
Southern Region (R-8)
1720 Peachtree Road, N.W.
Atlanta, GA 30367
404-347-2384

Forest Service, USDA
Eastern Region (R-9)
310 West Wisconsin Avenue, RM. 500
Milwaukee, WI 53203
414-291-3693

Forest Service, USDA
Alaska Region (R-10)
P.O. Box 21628
Juneau, AK 99802-1628
8-907-586-8863

Area Office

Forest Service, USDA
Northeastern Area—S&PF
100 Matsonford Rd. - Suite 200
Radnor, PA 19087
215-975-4111

Chief's Message

Photo by Jill Bauermeister

For the Forest Service, 1989 was a challenging and exciting year. I am pleased with the extra effort of our employees in achieving the accomplishments listed in this report, especially in view of the difficulty and controversy surrounding the management of our national forests.

We achieved most of our program goals and targets in 1989, in spite of numerous administrative appeals and lawsuits. The most notable issue facing the Forest Service was the question of spotted-owl and old-growth Forests in the Pacific Northwest, an issue settled temporarily by the Congress.

During the year, the Forest Service developed a 7-point agenda to better focus the energy of our employees on some priority items. They are 1) innovation and creativity, 2) workforce diversity, 3) forming partnerships, 4) building grassroots support, 5) customer satisfaction, 6) rounding out Forest Service programs within the multiple-use framework, and 7) conservation leadership.

I'm really proud of our progress in expanding the number of partnerships we have formed with national, State, and local organizations. Our partnerships with 900 organizations allow thousands of people to get involved in making things happen in their national forests.

Through their commitment and hard work, the people of this country have joined with the Forest Service to help us get the recreation, fish, and wildlife job done on the national forests.

The coming year will bring to a close our first century of managing public lands. In 1991, we will celebrate the centennial of the establishment of the first Forest Reserves—an event that established a tradition of land management that is an example for the world and of which the Forest Service is proud to be a part.

F. Dale Robertson
Chief

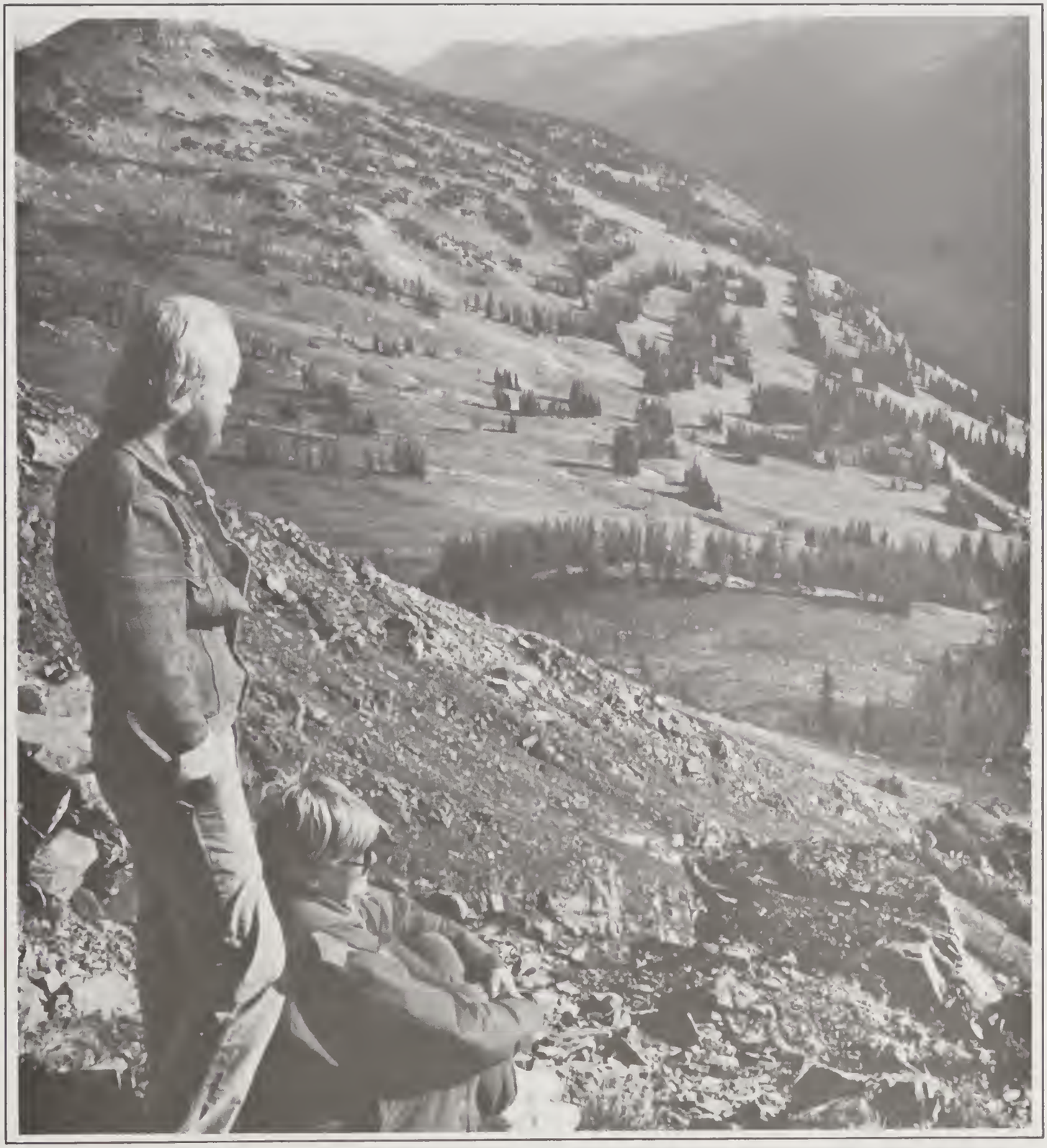


Photo by Cary Given

F.S. Photo

CONTENTS

INTRODUCTION

WISE USE OF FOREST RESOURCES...

Photo by Rod Replogle

F.S. Photo

Photo by Barry Nehr

Photo by Jack Cameron

...INTEGRATED RESOURCE MANAGEMENT

WISE USE OF FOREST AND RANGELAND RESOURCES

Our Mission

The Forest Service cares for the Nation's forests and rangelands. We manage the national forests and rangelands to serve the needs of the people who own and share them and conserve them for future generations. We work with State forestry organizations to help private landowners apply good forest practice on their lands. We conduct research to find better ways to manage and use our Nation's resources.

Multiple-Use Management

Managing the national forests and grasslands for many uses—commonly known as multiple-use management—means, in its most fundamental sense, sharing the land in ways most beneficial in the long term for most people. This land management approach, rooted in statute and a century-old public land management philosophy, weighs the interests of all of the American people. It is an approach of productive but wise, protective, "conservative" use of resources that has served this Nation well and continues to do so in our stewardship of 156 national forests, 83 experimental forests and ranges, 19 grasslands, and 15 land-use projects.

The "wise use" of our natural resources also guides the Forest Service's cooperative work with State governments as they encourage and support private owners in management practices that sustain and increase land productivity while protecting the environment and helping to meet current product demand. Wise use principles also direct our research. Researchers in pursuit of scientific and technical knowledge to enhance and protect productivity and the environment on all of America's forests and rangelands devote special attention to multifunctional and long-term natural resource issues of national and international scope.

The Challenge

Public demand for the use of our national forests and grasslands as well as those in private ownership is heavy, complex, and competitive. Our growing population, particularly in our large urban centers, encroaches on surrounding forest lands. Demand for wood and wood-derived products, forage and browze, game, water, and minerals and at the same time for the preservation of wilderness, biodiversity, and landscape beauty and for the protection of water, air, and soil quality makes "harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land" more challenging than it ever has been (Multiple-Use Sustained-Yield Act of 1960). Besides our national priorities, international issues such as acid rain, wildlife habitat destruction, species loss, and global warming add to the complexity of the manager's decisionmaking. The task of managing our natural resources is not easy.

Meeting the Challenge

In our caring for our forest and rangeland resources, the Forest Service continues to refine management practices to meet all our responsibilities, to focus our research, and to make our technology and our specialists more accessible to others of similar interest and responsibility.

Forest Plans and Integrated Resource Management in the National Forest System. Managing the national forests and grasslands for many uses requires careful planning and day-to-day vigilance in carrying out the plans to achieve balanced and coordinated use of our resources—water, forage, wood, wilderness, places for recreation, fish and wildlife, clean air, soil, diverse ecosystems, and minerals. The Forest Service devotes this kind of attention to each of the national forests and grasslands under our care.

Interdisciplinary Teams. Interdisciplinary management teams are essential to developing forest plans that are environmentally safe, economically efficient, and socially responsible and putting those plans into action. The members of these teams, made up of resource specialists—the wildlife biologist, the landscape architect, the forester, the recreation manager, the land planner, the archaeologist, the geologist—bring their own special understanding, skill, and talent to work out forest and grassland management strategies.

Community and Public Involvement. The American people are an important part of the land planning and management team. Through public involvement, on-the-ground managers and decisionmakers gain information from knowledgeable and caring people that is not readily available through other means: their concerns, their views on issues, and the management changes they desire. This exchange is a dynamic one. It leads to the discovery of alternative solutions to problems and other opportunities than those being considered to achieve the identified multiple goals for the forests and grasslands.

Research. To meet the challenge—the balanced use of forest resources—our managers will depend heavily on the findings of the scientific community, especially the work of Forest Service Research and their cooperators. Our Research managers, as they plan strategically for one of the most extensive programs of research focused on resource interrelationships in existence, look for trends in renewable natural resource management to project research needs.

A better scientific understanding of the effect one use has on another will help us manage more effectively. From our research data, we know, for instance, some uses enhance the forest resource for other uses, while others modify the resource, interfering with a certain use. We also know that with new scientific information and changes in resource conditions and public need the mix of uses must be adjusted periodically. Sharing our research and our experience with our international neighbors can improve natural resource management throughout the world. Managing wisely now means managing in the world community.

The Cooperative Way. In the past few years, it has become increasingly clear that the management of our resources is not only affected by what we do, but by

what our neighbors do—those next door, those in the next State or country, those on the other side of the world. Through State and Private Forestry, we strengthened our cooperative ties with State forestry. In confronting the demand for product while protecting the environment and sustaining the resource, it is important that the nonindustrial landowner develop a broader management approach and examine the resource for all its values. State and Private Forestry also takes the lead in transferring information and technology inside and outside the Forest Service, nationally and internationally, to improve forest resource management, use, and protection.

We have increased cooperation and communication with every segment of the society through other ways:

- Reaching out to public interest groups, forest neighbors, and individuals interested in the forests and how they are managed.
- Strengthening information and program sharing with other Federal agencies.
- Working closely with the Congress.
- Listening to industry's request for resource use.
- Developing partnerships and grassroots programs that involve a cross section of people to work with us in this important business of caring for the land and serving people.

Perhaps no time in the management of our natural resources has it been clearer that no land manager is "an island unto itself" but "each is a part of the main"—that this is a time of interdependency. Judicious management of our resources is essential for meeting the demands of our people while conserving the forests and rangelands as a permanent resource. We are better prepared to care for the land and serve the people than we have ever been.

A Proud Heritage

Conservation Policy. On February 1, 1905, President Theodore Roosevelt signed the Transfer Act, which shifted the responsibility of caring for the Nation's forest reserves from the Department of the Interior to the Department of Agriculture. That same day, Secretary of Agriculture James Wilson endorsed Gifford Pinchot's conservation philosophy of wise use and service to the American people. The forest reserves, later renamed the national forests, were to be managed for the greatest good for the greatest number of people in the long run. Local officials would address local questions—a philosophy that has made the Forest Service one of the more decentralized agencies in the Federal Government. We also work closely with Congress in responding to national interests and needs.

Values and Principles. Early forestry leaders like Roosevelt and Pinchot combined vision with action. Their principles and philosophies helped mold Forest Service values and culture that have stood the test of time—conservation leadership, public service, responsiveness, integrity, a strong land ethic, and professionalism characterized by people who know their jobs and do them well. These values and principles are the bedrock on which the Forest Service stands—they will support us as we adapt to change and thrive on challenge.

LEGISLATIVE BASIS

The Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, as amended, directs the Secretary of Agriculture to prepare a comprehensive, long-range assessment of the Nation's renewable resources and to develop a program for Forest Service activities. It also requires the Secretary to submit to Congress an annual report on Forest Service accomplishments and progress in carrying out the RPA Program. This report covers fiscal year 1989. 1/

Required in the annual report are the following:

- A description of the status of major research programs, significant findings, and ways these findings will be applied in programs.
- A description of the cooperative forestry assistance programs and their accomplishments, status, needs, and work backlogs.
- A report on the progress of incorporating mandated standards and guidelines into the land management plans for the units of the National Forest System.
- A summary, on a representative sample basis, of estimated expenditures for reforestation, timber stand improvement, and the sale of timber from the National Forest System—compared to the return to the Government from such timber sales.
- An identification, on a representative sample basis, of advertised timber sales made below the estimated expenditures mentioned above.

This document includes the following reports that Congress requires at the time of the annual report:

- A report identifying the amount and location, by Forest, State, and productivity class, of (1) all lands in the National Forest System where land management plans have indicated the need to reforest areas that have been cut over or otherwise denuded or deforested, and (2) all lands with stands of trees that are not growing at their best potential.
- An estimate of the funds needed to successfully replant an acreage equal to the acreage to be cut over that year.

- A report on the amounts, types, and uses of pesticides used in the National Forest System, including the beneficial or adverse effects of such uses.

In addition to the requirements of the RPA, this annual report contains information on accomplishments and outputs in relation to commitments in the appropriate Forest Service budget.

We inventory and assess the forest and grassland resources, monitor their management, and report regularly to the American people on their use, performance, productivity, and health.

1/ Unless otherwise stated, all references to years in the report are fiscal years.

Photo by Dave Reider

NATIONAL FOREST SYSTEM

"...GREATEST GOOD FOR THE GREATEST NUMBER"

Photo by Rob Tucher

INTRODUCTION

Forest Service reports typically describe multiple use management in general terms. They do not describe how the specifics of multiple use management are translated into practices on the ground. Because Forest Service budgets and organization are functionally oriented the Annual Report of the Forest Service and other reports are also functionally oriented. Thus, the record of multiple use management has not been well documented or reported. Multiple use management planning is now well documented in the Forest Plans developed in response to the National Forest Management Act. This year's Report of the Forest Service takes a first step toward reporting multiple use management as it is placed on the ground.

In the next few pages we present our pilot effort to depict for the public how multiple use management practices have been implemented for selected management areas on each of three National Forests. The products and uses and their variation among management areas within and between forests are likewise described. The areas selected for multiple use management reporting are from the Lolo, Black Hills, and White Mountain National Forests.

In 1960, Congress enacted the Multiple Use Sustained Yield Act (16 U.S.C. 531), which asserted that "national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes." That Act defined multiple use as "the management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people." In applying the principles of multiple use management to actual activities on the ground, the Forest Service relies on the joint professional judgement of foresters, range conservationists, wildlife and fisheries biologists, and sociologists working in concert and responding to the input of public interest groups and individuals.

LOLO NATIONAL FOREST

Selected Multiple Use Management Areas

The Blue Mountain Recreation Area is 5 miles southwest of Missoula, Montana (population 60,000) and covers approximately 5,120 acres. The area receives heavy dispersed recreation use. Other important uses include big game winter range, livestock grazing, and timber harvest. The primary vegetation type is ponderosa pine—Douglas fir with bunchgrass or shrub understories. The forest stands are relatively young and vigorous over much of the area as a result of past harvest activities.

The Mormon Creek Area is 15 miles southwest of Missoula covering 3,000 acres. The primary recreational use is hunting, although there is horseback riding, hiking, and mountain biking as well. Big game winter range is an important feature for this area, along with timber harvesting. Vegetation types are similar to those found in Blue Mountain. Timber stands are dominated by mature trees and the area has had less harvest than the Blue Mountain area.

Resource Management Goals

Blue Mountain Recreation Area. Forest Plan goals for this area are:

1. Provide for a wide variety of dispersed recreation opportunities in a forest setting available to a wide segment of society.

2. Manage other resources in a way that does not prohibit or restrict recreation use.

3. Protect and maintain water quality and fisheries habitat and improve opportunities for dispersed recreation.

Management for this area is influenced by past and present use as an outdoor playground. The area's proximity to Missoula makes it ideal for outdoor recreation in a forest setting.

Mormon Creek Area. Forest Plan goals for this area are:

1. Provide for healthy stands of timber and optimize timber growing potential.

2. Develop equal distribution of age classes (even-age management) to provide sustained timber production.

3. Provide for dispersed recreation opportunities, wildlife habitat, and livestock use.

4. Maintain water quality and stream stability.

5. Optimize winter range forage production for deer and elk.

Maintaining water quality and stream stability is a primary resource management goal in the Morman Creek area.
Photo by Roy Murphy

This area is not used for recreation as much as Blue Mountain. Motorized use is restricted during winter months to avoid disturbing deer and elk. Timber stands are generally mature. Timber harvest and fire can be prescribed to improve big

game habitat and maintain ecosystem health.

Public Involvement. The public was involved in identifying issues and developing alternatives for both areas, but the level of involvement differed. The Audubon Club, motorcycle club, equestrian club, 4-wheeler club, ski club, snowmobile club, and numerous concerned citizens participated in the Blue Mountain Plan. The Mormon Creek project generated less interest from the general public. Respondents were limited to several adjacent landowners who voiced concern about hunting near their homes. The Montana Department of Fish, Wildlife, and Parks helped develop a strategy for maintaining big game winter range productivity.

Management Practices Applied

Blue Mountain Area Standards and Guidelines for Multiple Use Management

- Recreation area development will accomodate a wide variety of dispersed recreation opportunities including a 2.5 mile nature trail for elderly and handicapped, and an interpretive nature trail brochure.
- Livestock grazing is permitted but adjusted to recreation objectives.
- Timber harvest is set to meet other resource use objectives.
- Road access is open for nine miles and closed for five miles to meet recreation objectives.
- Prescribed fire is used on approximately 1,000 acres per year for big game winter range improvement and ecosystem stability.
- Nine miles of roads are regularly maintained with dust abatement on 3 miles. Erosion is controlled on 18 miles of road and trails.

Livestock grazing is permitted in the Blue Mountain area, but is adjusted for recreational activities Photo by Scott S. Warren

Mormon Creek Area Standards an-Guidelines for Multiple Use Management:

- Harvest 137 acres using clearcuts on 126 acres and selection/overstory cuts on 11 acres.
- Reforest 164 acres.*
- Curb spread of insects and disease by thinning on 23 acres and disease control on 133 acres.
- Construct fish habitat improvement structures on two miles of stream.
- Restrict motorized access on roads to protect elk winter range. Maintain eight miles of road.

Motorized access on roads is restricted to protect deer and elk winter range. F.S Photo

*NOTE: Reforestion will exceed harvest acres because acres previously planted require fill-in planting.

The difference in products and uses displayed below reflects the influence of differences in multiple-use management strategies between the Blue Mountain and Mormon Creek areas:

Outputs	Blue Mountain	Mormon Creek
Timber harvested (MBF)	0	1,118
Recreation (MRVD's)	18	1
Grazing (domestic, AUM's)	228	0
Active grazing allotments	1	0
Big game forage (lbs/ac)	200	120
Wintering elk population	45-50	60-70
Water quality (detectable decline)	no decline	no decline

BLACK HILLS NATIONAL FOREST

Selected Multiple Use Management Areas

- The Black Hills National Forest lies in western South Dakota and northeastern Wyoming, where mountains and rolling foothills rise from the surrounding plains. The Forest contains 1.2 million acres, which are intermingled with private, State, and other Federal lands. Although mining, logging, and ranching are important to the local economy, the Black Hills National Forest is also a popular recreation and tourism area.

- Norbeck Wildlife Preserve was established by Congress in 1920 "for the protection of game animals and birds and to serve as a breeding place therefor." But Norbeck is far more than a wildlife preserve. Norbeck lies at the heart of the most intensively used recreation area in the Black Hills. Bordered by Mt. Rushmore National Memorial and by South Dakota's Custer State Park, it includes many scenic highways, hiking trails, and developed recreation sites. Black Elk Wilderness lies within Norbeck's boundaries. Traditional uses of Norbeck include a variety of recreation activities, livestock grazing, mining, hunting, and logging. Norbeck contains approximately 17,000 acres of National Forest System land. The primary vegetation type is ponderosa pine. Mature and old growth stands of ponderosa pine dominate. Openings and young pine stands are in short supply. Planned management however, will create habitat diversity needed by wildlife.

- The Flynn-Pringle Area lies south of Norbeck and also contains approximately 17,000 acres of National Forest System land. Ponderosa pine is the primary vegetation type. Timber stands consist of a dense understory and scattered, decadent overstory. The topography of Flynn-Pringle is similar to but less rugged than Norbeck. Big game winter range and timber production are the most important uses, although livestock grazing, dispersed recreation, and mining also occur. Planned management will maintain existing uses.

Resource Management Goals

Norbeck Wildlife Preserve. Forest goals are this area are to:

- Manage habitat for maximum number of wildlife species.

- Regulate human uses to favor the needs of wildlife.

The Forest Service, the South Dakota Department of Game, Fish and Parks, and many members of the public see

Family picnicking in an open Ponderosa pine forest. Ponderosa pine is the primary vegetation type on the Black Hills National Forest. Photo by DelMar Jaquish

Construction of range and wildlife water developments was a primary activity planned for the Flynn-Pringle area. F.S. Photo

Norbeck as a place where wildlife needs dominate other uses. But beyond that, the public demands that Norbeck be managed as a special place, to protect its aesthetics and traditional recreational uses. As a result, planned management of Norbeck favors wildlife needs, aesthetics and those forms of recreation compatible with wildlife needs. Timber harvesting is limited to the needs for habitat management. Other uses—such as livestock grazing, motorized recreation, and mining—are restricted.

Flynn-Pringle Area. Forest plan goals are to:

- Emphasize wood fiber production by growing trees suitable for sawtimber.
- Provide forage and cover on big game winter range.

Management direction for the Flynn-Pringle area derives primarily from historical human and wildlife uses. Public interest in management of Flynn-Pringle is much less intense than for Norbeck. However, the following issues were resolved during project planning: creating elk habitat; maintaining visual quality, particularly as seen from Wind Cave National Park; reducing road density; and improving timber stand condition.

Management Practices Planned

Activities planned for Norbeck Wildlife Preserve include:

- Perform aspen/birch release and regeneration cuts (1,200 acres).
- Perform patch clearcuts (1,800 acres).
- Perform spruce selection cuts (200 acres).
- Perform ponderosa pine shelterwood cuts (3,500 acres).
- Preserve designated old growth (3,570 acres).
- Construct wildlife water developments (6 structures).
- Undertake road construction (6 miles), reconstruction (47 miles), and obliteration (37 miles).
- Prohibit new mineral entry.
- Perform fuel treatment and prescribed burning for wildlife forage (4,900 acres).
- Maintain trails (25 miles) and obliterate trails (4 miles).
- Revise allotment management plan to improve range condition.
- Close areas to motorized recreation.

Activities planned for Flynn-Pringle Area include:

- Perform aspen/birch release and regeneration cuts (150 acres).
- Perform patch clearcuts (180 acres).
- Perform ponderosa pine shelterwood cuts (2,200 acres).
- Preserve designated old growth (450 acres).
- Construct roads (3 miles), reconstruct road (19 miles), obliterate roads (10 miles).
- Construct range and wildlife water developments (8 structures).
- Prescribed burn (1,100 acres).

WHITE MOUNTAIN NATIONAL FOREST

Selected Multiple Use Management Areas

The White Mountain National Forest in New Hampshire and Maine is one of the smaller, but more highly visited National Forests in the System. It is within a day's drive of more than 65 million people. The rugged and scenic White Mountains attract more than six million visitors a year. The management areas described are within a three-hour drive of the Boston metropolitan area.

Output	Norbeck Wildlife Preserve	Flynn-Pringle Area
Commercial timber volume offered (MMBF)	33.4 *	8 **
Open road density (miles/square mile)	1.9	3.0
Recreation (annual RVDs/acre)		
Dispersed	2.78	1.9
Developed	2.68	.2
Trails (miles)	25.0	0.0
Livestock grazing (acres/AUM)	4.7	3.9
Forage production (tons/acre/year)	.30	.25
Forage allotted to livestock	6 %	16 %
Wildlife habitat diversity, expressed as forest successional stages:		
Grass-forb	15-20 %	4-7 %
Shrub/seedling/sapling	15-20 %	not specified
Young/mature	25-50 %	not specified
Old growth	20-25 %	5 %
Minimum big game hiding cover	50 %	40 %
Minimum habitat capability	80 %	80 %

* Volume offered affected by need to create openings (patch clearcuts) and overstory removal/seed cuts of large-diameter trees.

** Predominantly intermediate thinning and overstory removal.

The Zealand management area and Kilkenny management area were both heavily logged and burned over at the turn of the century. Their forests are now made up of birch, beech, and maple at lower levels, with spruce and fir at elevations above 2,500 feet.

The Zealand area covers 10,438 acres of mountains, rivers, and hardwood forests. Mountain peaks up to 4,000 feet surround the valley. The Zealand River, a popular trout fishing stream and the water supply for a municipal water system, bisects the area. A gravel, all-weather road follows the Zealand River to a trailhead parking lot for access to a backcountry hut and the Appalachian National Scenic Trail. Trails for hiking, snowmobiling, and crosscountry skiing spiderweb the area. Two campgrounds at the head of the valley have 74 campsites.

The Kilkenny area is more remote than the Zealand area relative to the main attractions of the National Forest and contains 15,500 acres. The Ammonoosuc River bisects the area. A gravel, all-weather, loop road provides access. The area provides water for a nearby city, and is used for hunting and fishing. Topography is less pronounced with elevations up to 2,000 feet.

Resource Management Goals

Zealand Area. Forest plan goals are to:

- Protect scenic quality in all management practices.
- Provide a wide range of winter and summer recreation opportunities.
- Maintain production of high quality northern hardwoods.
- Maintain wildlife habitat diversity.

Kilkenny Area. Forest plan goals are to:

- Maintain scenic quality while emphasizing wildlife and production of northern hardwood timber.
- Improve wildlife habitat conditions.
- Provide for a diversity of wildlife species.
- Provide traditional recreation opportunities such as hunting and snowmobiling.

Zealand has a history of intense public use by diverse groups while Kilkenny is mainly used by local residents.

Management Practices Applied

Zealand Area Forest Plan Standards and Guidelines

- Timber: Harvest method will be single or small groups of trees, and some small clearcuts. Creation of large openings will be avoided, especially along the road.
- Visual: Minimize the amount of disturbance to scenery especially from timber harvest activity.

Management practices on the Zealand included maintaining existing opportunities for skiing. Photo by Ken Hammond

- Wildlife: Timber harvest will be limited to favor wildlife species dependent on mature forest conditions. There will be a moderate effort to meet wildlife habitat needs for clearings and varied tree types and ages.

- Recreation: Maintain and enhance existing opportunities for hiking, skiing, snow mobiling, camping, and driving for pleasure.

Kilkenny Area Forest Plan Standards and Guidelines

- Timber: Manage for timber production. Harvest method will be clearcutting in most areas. Harvest small groups of trees in deer wintering areas.

- Wildlife: Species dependent on younger forest types and clearings will be favored. Deer forage areas will be maintained.

- Recreation: Maintain hunting and snowmobiling opportunities while still placing a priority on timber and wildlife habitat management.

Output	Zealand	Kilkenny
Timber area allocations		
For harvest	6,717	13,195
No harvest	3,721	2,305
	10,438	15,500
Past Harvest Volume (10 yrs.)(Million bd. ft.)	4.9	18
Future Harvest Volume (10yrs)(Million bd. ft.)	4.6	22
Total Acreage in Trees (0-10 yrs old)	500	979
Miles of Roads	13.2	31.5
Fishing	1,000	2,000
Hunting	300	1,000
Snowmobiling	5,000	1,500
Crosscountry Skiing	4,000	100
Hiking	19,000	1,000
Developed Camping	52,000	None
Total Recreation Use in Visitor Days	81,300	5,600

Trails for hiking, snowmobiling and crosscountry skiing are abundant in the Zealand area.
Photo by Sam Frear

Summary

These examples illustrate how ecologically similar areas are producing very different results depending on which multiple use management practices are applied. For instance, on the Lolo National Forest the Blue Mountain area is not important for timber production but it is needed for the production of 18,000 recreation visitor days. On the Mormon Creek area, the reverse is true. Nearly one million board feet of timber is produced while recreation use is only 1,000 visitor days. As these examples illustrate, the management practices have been designed for each area using the skills and judgement of resource professionals and input received from interest groups and individuals.

This pilot effort demonstrates the difficulties and challenges in displaying the application and results of multiple use management. There are hundreds of designated management areas on the

123 National Forests. Each has a unique mix of multiple use management practices that reflect a great diversity in forest condition and local, regional, and national demands for their products, uses, and amenities. The diversity of on-site multiple use management on the National Forest System would be lost in any effort to summarize multiple use management in terms of totals or averages. The balance of the Annual Report follows the traditional functional style of reporting consistent with our budget structure and programmed targets provided by congressional appropriations. It also reflects the functional organization of the Forest Service in executing its budget and program obligations.

SCOPE

The Forest Service manages and protects the National Forest System under the principles of multiple use. The National Forest System consists of 191 million acres of land, an area nearly as large as the 14 Eastern States from North Carolina north through New England.

Original legislation authorized management of the national forests for timber production and watershed protection. However, management was also provided for recreation use, wildlife and fish habitats, and domestic livestock grazing as authorized under annual appropriation acts and land allocation for wilderness use. The Multiple-Use Sustained-Yield Act of 1960 provided permanent authorization for outdoor recreation, watershed, range, timber, wildlife, and fish management. That legislation also directed that the renewable surface resources be managed to achieve a sustaining yield without impairing the land's productivity.

The natural resources on National Forest System lands are among the Nation's greatest assets; they influence the economic, environmental, and social well-being of all Americans. Managed for many uses and benefits at a cost of approximately $2.75 billion, the income generated from national forests and grasslands totaled $1.84 billion in 1989.

The National Forest System lands:

- Provide habitat for nearly 60 percent of the wildlife animal species in the Nation, including 171 threatened or endangered species.
- Supply more outdoor recreation than lands under the jurisdiction of any other Federal agency (more than 40 percent of the total)—over a quarter billion visitor-days a year.
- Include more than 32.5 million acres of the National Wilderness Preservation System, 79 percent of the total, outside of Alaska (that is, 1 acre of every 6 of the National Forest System is in designated wilderness).
- Are the source of approximately 50 percent of the West's water supply and approximately 5 percent of the East's.
- Contain 300,000 miles of streams and 2.2 million acres of lakes, ponds, and reservoirs, primarily in the 11 Western States—important recreation and fisheries resources.
- Contain nearly 50 percent of the Nation's softwood sawtimber inventory and provide approximately 13 percent of the total wood harvested annually in the United States.
- Contain nearly 25 percent of the Nation's potential energy reserves; hold unique deposits of critical minerals, including approximately 14 percent of the world's lead and 25 percent of its molybdenum, and are the tenth largest producer of crushed stone in the Nation.
- Provide nearly 104 million acres of forage-producing lands in 35 States for wildlife, domestic livestock, and wild, free-roaming horses and burros.
- Return 25 percent of receipts to 41 State governments and Puerto Rico for funding public schools and roads in counties where the national forests are located—a total of $353.8 million in 1989.

Managing the National Forest System continues to be controversial. Forest management decisions affect people and communities in a variety of ways. Using the concept and principles of multiple use, the Forest Service makes decisions about resource goods, services, and amenities from the national forests, including the appropriate share of resources in ways that respond effectively to the resource needs and desires of the public.

The Forest Land and Resource Management Plans for the national forests address the resource use balance and appropriate share question. Through the Plans and with public support, Forest Service leadership and initiative are bringing more balance and harmony to national forest management by placing increased attention on recreation, fish, and wildlife programs and activities.

Public involvement is not limited to land and resource management planning. Many substantial and financially valuable national forest partnerships with private groups and individuals are in place and working to enhance our capability to manage lands and resources.

LAND MANAGEMENT PLANNING

The Planning Process

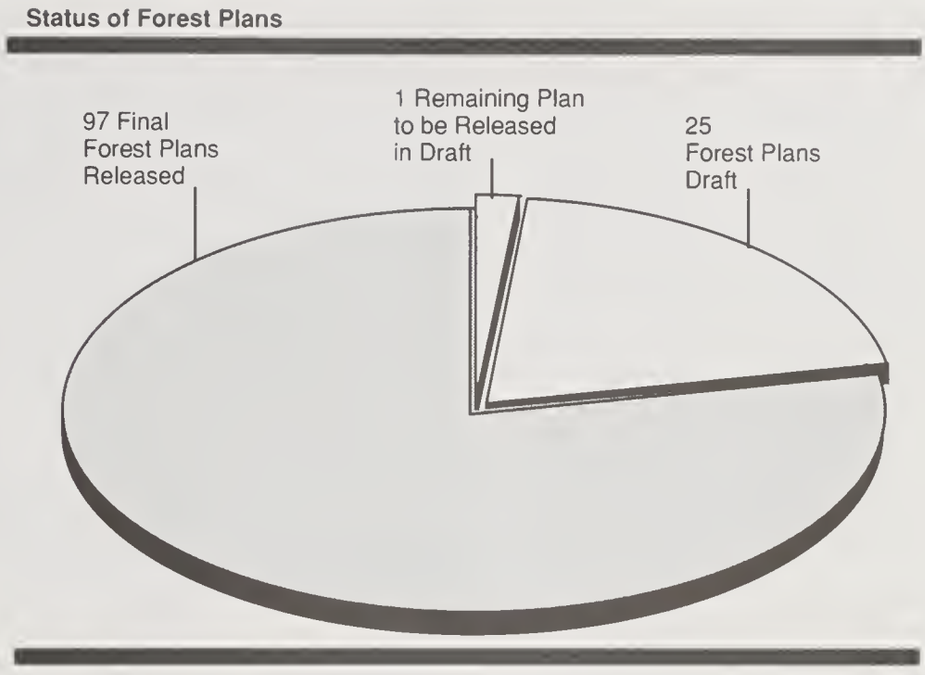
Land management planning is a continuing process; it addresses the changing resource demands made on the supply of renewable resources and minerals. The Forest Service, with public input, updates and amends Forest Plans as needed to ensure that adequate resources will be available for future generations.

Regional Guides

All nine Regional Offices have published final Regional Guides and Environmental Impact Statements (EIS's) required by the National Forest Management Act (NFMA). The guides address primary issues and management concerns of the Regions and provide tentative resource objectives as recommended by RPA for

each national forest within each Region. Although the guides ensure that a consistent approach to national forest planning is followed throughout each Region, they offer the managers of each forest considerable latitude in formulating their individual Forest Plans. The guides also help coordinate National Forest System programs with the Forest Service State and Private Forestry and Research programs.

Status of Forest Plans



Status of Forest Plans

Under NFMA, 123 Forest Plans are being developed. The Washington Office has reviewed drafts of all 123, except the Klamath National Forest. The Tongass National Forest Plan, which was finalized in 1979, is now being revised. During 1989, we finalized 7 Forest Plans in the Pacific Southwest and Pacific Northwest Regions, bringing the total final plans to 97. The number of Plans in draft form is 25.

Table 5 lists the draft and final Forest Plans and Environmental Impact Statements prepared to date.

Implementation and Monitoring of Forest Plans

Most of the national forests have completed and are now implementing their Forest Plans. We are working with the public to monitor how well the Plans are actually working on the ground. Amendments to the Plans will be made as changes are needed.

The Forest Service continues to supply Congress accurate budget information developed from the Plans. However, the appropriations process adjusts the planned outputs on an annual basis—from the Plan level to one reflecting current economic conditions and realistic expectations. The ability to achieve outputs projected by a Forest Plan will be reflected by the rate at which a Plan is implemented, based on appropriations approved by the Congress. If at any time the objectives of a Forest Plan become unachievable, it will be necessary to amend that Plan.

Visitors to the Selway-Bitterroot Wilderness Area in Idaho enjoy rafting down the Selway Wild and Scenic River. Photo by Jill Bauermeister

Status of Appeals

The appeals process allows persons outside the Agency to review Forest Plan decisions and to object to decisions at higher Forest Service organizational levels. The process guarantees that objections are reviewed fairly. Approximately 825 appeals have been filed on Forest Plans, of which approximately 515 have been resolved. At the close of 1989, 49 Forest Plans had been cleared of all appeals.

Wilderness Legislation

At the beginning of 1989, there were approximately 32.5 million acres of wilderness in the National Forest System.

During the first session of the 101st Congress, Members introduced 15 wilderness bills involving the States of Nevada (4), Idaho (2), California (5), Colorado (1), West Virginia (1), and Alaska (2). The bill for West Virginia proposed a minor boundary adjustment for the Cranberry Wilderness. The statewide bill for Nevada, containing 733,000 acres, has moved through both the House of Representatives and the Senate. Hearings have been held on Idaho, California (Los Padres National Forest), and Alaska bills. In addition, a bill was introduced on Bureau of Land Management lands in California that involve areas on the San Bernardino, Sequoia, and Inyo National Forests.

The established trend of including additional acres in wilderness bills over that recommended in Forest Plans continues in the 101st Congress.

A young man enjoys the cool waters of the Tellico River on the Cherokee National Forest.
Photo by Jill Bauermeister

Wild and Scenic Rivers

The National Wild and Scenic Rivers System now totals 9,286 miles, of which 3,338 miles are managed by the Forest Service. With the additional 35 national forest rivers added to the system late in 1988, developing river management plans and integrating them with Forest Plans have been important tasks this year.

In 1989, legislation was introduced to add five rivers—the Pecos and East Fork Jemez in New Mexico and the Sespe, Sisquoc, and Big Sur in California—to the system. Congressionally authorized studies are under way on nine rivers—the Klickitat and White Salmon in Washington and the Blue, Chewaucan, North Fork Malheur, South Fork McKenzie, Steamboat Creek, Upper Klamath, and Wallowa in Oregon. The Allegheny River study in Pennsylvania is in its final stage of completion.

Studies conducted as a part of the National Forest planning process have identified more than 400 additional rivers, totaling over 10,000 miles, with outstanding values that make them eligible for the National Wild and Scenic Rivers System. While 346 of the identified rivers require further study, we are recommending that 85 of these rivers be included in the system. The Forest Service has initiated river studies that are still in progress on more than 50 of these rivers, including the Little Bighorn in Wyoming, the North Fork Mokelumne in California, the Nolichucky in North Carolina and Tennessee, and the Sopchoppy in Florida. Other studies conducted on a forest-wide or statewide basis involve 13 rivers in Arkansas, 25 in Michigan, 8 in Tennessee, and 11 in West Virginia. Some of the Forest Plans nearing completion in the States of Washington, Oregon, and California will include National Wild and Scenic Rivers System recommendations for designation as a part of the Plans.

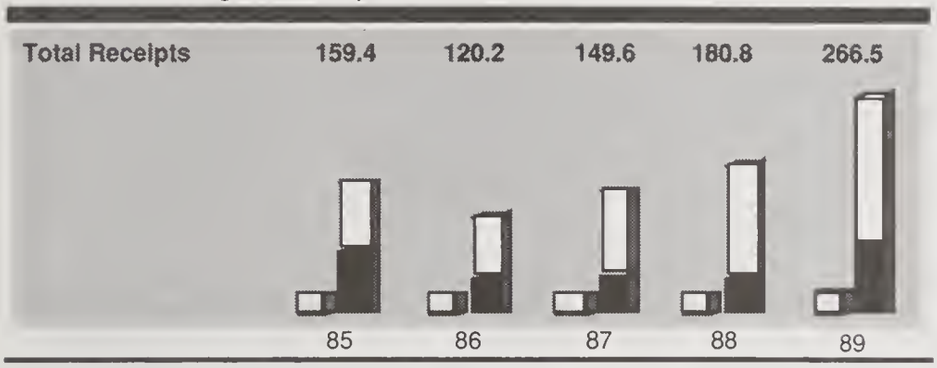
These Wild and Scenic Rivers study activities are aimed at meeting the Chief's goal of recommending 200 additional rivers for the system by 1993.

MINERALS

Energy-producing resources under National Forest System lands include oil, natural gas, coal, geothermal steam, and uranium. Minerals of strategic importance include platinum, palladium, chromium, nickel, tungsten, and molybdenum; gold, copper, zinc, silver, lead, and phosphate also are found in significant amounts. The Forest Service manages its mineral resources in a manner compatible with the management of other resources. The Agency cooperates with the Department of Interior to coordinate the management of federally owned minerals within the National Forest System. The Forest Service also works with States and local agencies in managing the mineral operators associated with the development of private minerals estates.

In 1989, total receipts from rents, royalties, sales, and bonus bids for minerals totaled $266 million—$85 million more than in 1988. This increase in 1989 revenues resulted primarily from privately owned minerals that reverted to Federal ownership in 1988 and 1989. Also, the implementation of a completely competitive leasing system, through the Oil and Gas Reform Act of 1987, provided for

Minerals--Funding and Receipts



	85	86	87	88	89
	(Million Dollars)				
Funding	26.6	27.2	27.0	26.7	28.4
Receipts Collected Through U.S.D.I.	81.9	77.3	102.9	137.4	179.6
Receipts Reported by the F.S.	77.5[1]	42.9	46.7	43.4	86.9
Receipts as a Percent of Funding	599.2	441.9	554.1	677.2	938.4

[1]See table 60 footnote 1.

Although accomplishments exceeded RPA and funded targets, the number of cases remaining unprocessed at the end of the year increased from 1,479 in 1988 to an estimated 1,574 in 1989. The Forest Service lacked the resources to adequately administer the unexpected increase in processing activity. Almost 426 unprocessed cases are located in proposed wilderness areas where land questions remain.

The mineral withdrawal review, which involves 1,980,000 acres of National Forest System lands and is required by the Federal Land Policy and Management Act of 1976, Section 204(1) (43 U.S.C. 1714), is almost 95 percent complete. There are 1,681 withdrawals that affect 6,150 sites. The Forest Service review will be completed in 1989, with ensuing resolution of legal actions, and will be incorporated into the Secretary of the Interior's report to the President, which is scheduled for 1991.

increased bonus bids and rents. New development and increased energy prices also contributed to the revenue increase. Only a small part of the 1989 receipts are the direct result of activities conducted during the year; about 70 percent come from work done in prior years. Similarly, 1989 accomplishments will lead to receipts in future years.

During 1989, the Forest Service processed 29,152 leasable, locatable, and salable minerals cases. This exceeds the funded target by 16.5 percent (table 6) and surpasses the 1989 RPA level. The funded minerals case load target represents an estimate of the anticipated workload based on current trends. Activity levels, however, increased as minerals market conditions changed, and the increase resulted from a growing locatable program and renewed interest in oil, gas, and coal. Activities included the processing of lease applications, prospecting permits, validity examinations, operating plans, geophysical permits, and mining proposals for private minerals estates.

Low impact drilling on the Mountain City Ranger District, Humboldt National Forest.
Photo by Carol T. Powers

Since the passage of the Federal Onshore Oil and Gas Reform Act of 1987, the Forest Service, coordinating with special interest groups, industry and the Bureau of Land Management, has promulgated regulations for administering its minerals resources. The National Academy of Sciences and the General Accounting Office continue to conduct studies to evaluate how oil and gas resources should be considered in land-use plans.

The Forest Service, in cooperation with Sunshine Mining Company, designed and developed the first of 20 Smokey Bear commemorative medallions. A forest landscape scene on the medallion symbolizes the fire rehabilitation efforts of the Greater Yellowstone Recovery Program. Sales proceeds will go to fire rehabilitation and Smokey Bear funds.

President George Bush receives one of the first Smokey Bear commemorative silver medallions. The coins are minted by the Sunshine Mining Company through a cooperative agreement. Funds from the coins go toward rehabilitation efforts for the Yellowstone fires.
Photo by Carol T. Powers

LANDS

Landline Location

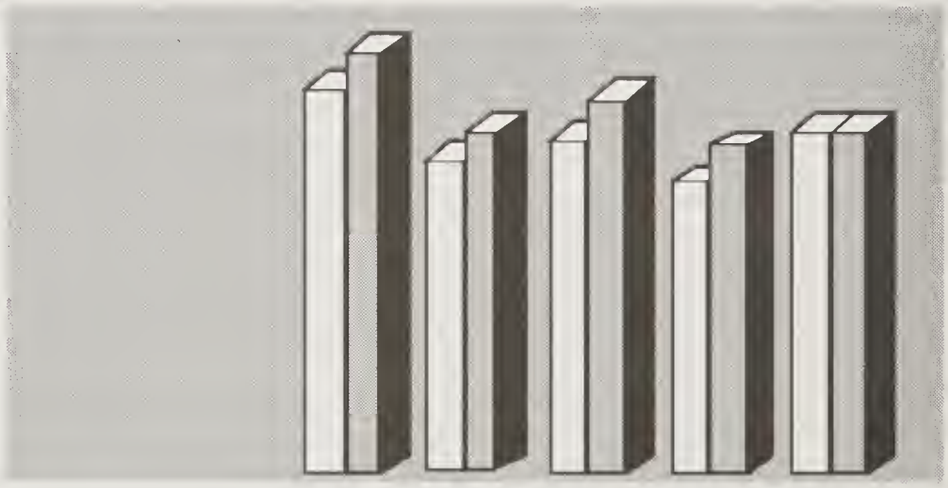
Accurate location of landlines—the legal boundaries between National Forest System lands and other ownerships—is essential for managing these lands, protecting them from encroachment, and providing their resources to the public. In 1989, the Forest Service used the $28.678 million appropriation to locate a total of 4,775 miles of property boundary—98 percent of the funded target of 4,851 miles.

The RPA recommendation is to locate, mark, and post all National Forest System property boundaries by the year 2020. By the end of 1989, we had completed 94,777 miles of the total 272,409 miles of National Forest System property boundaries.

Land Exchange

Land exchanges improve National Forest System landownership patterns by protecting key resources and improving management effectiveness. In 1989, the Forest Service exchanged 87,715 acres of National Forest System land for 128,411 acres of non-Federal land. We exceeded the planned amount of exchanges in acre-

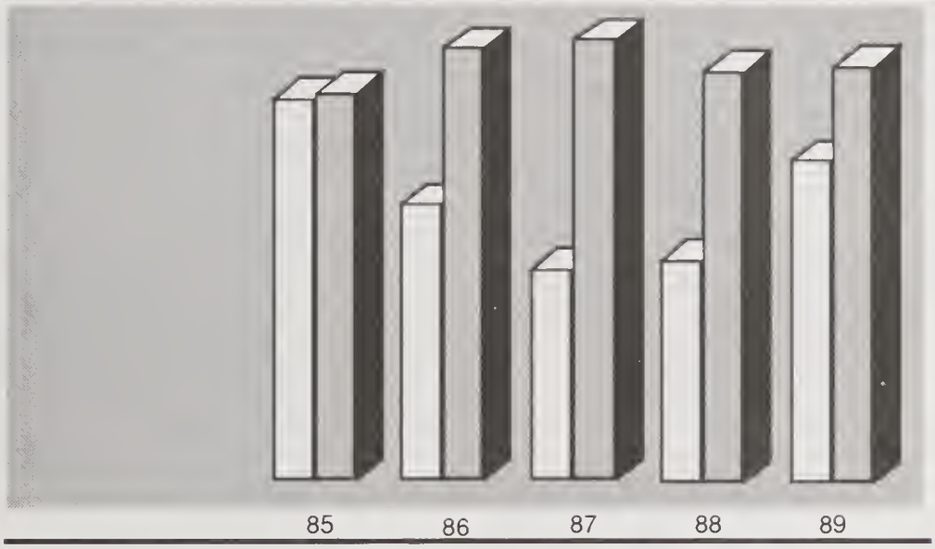
Landline Location Accomplishments



(Thousand Miles)

	85	86	87	88	89
Funded	5.4	4.4	4.7	4.1	4.8
Accomplished	5.9	4.8	5.2	4.6	4.8

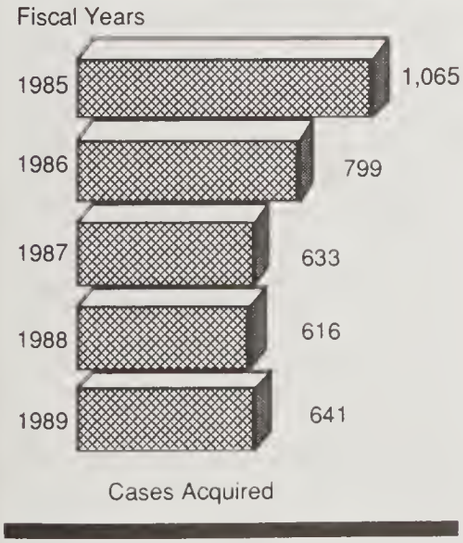
Land Exchange Accomplishments



	85	86	87	88	89
Thousand Acres Funded	117	85	65	68	99
Thousand Acres Accomplished	119	133	135	126	128

age. Much of the non-Federal land acquired through land exchanges is within classified wilderness areas, national recreation areas, wild and scenic rivers, national trails, and other congressionally designated areas.

Right-of-Way Acquisitions



Thousands of acres of critical wildlife habitat, wetland, and riparian areas were acquired. National forest property lines were reduced by 1,414 miles in 1989, saving approximately $7.8 million in future landline location costs or approximately 1.2 times the $6.4 million cost of exchange efforts. In future years, additional savings will result from fewer trespass cases, special-use permits, and rights-of-way cases.

In 1989, non-Federal landowners paid $671,000 in cash equalization payments, while the United States paid $275,000. The total amount ($0.95 million) was less than 1 percent of the appraised land value.

Small Tracts Act Cases

Since February 1984, when regulations to implement the Small Tracts Act of 1983 became effective, 1,033 cases, mostly involving encroachment, have been resolved (including 210 cases in 1989). In all, 1,597 acres of Federal land have been sold or exchanged; in return, the United States has received 1,246 acres of land and been paid $1,381,595.

The Small Tracts Act of 1983 authorizes the Secretary of Agriculture to sell or exchange certain small parcels of National Forest System land. Included are unmanageable parcels of various sizes and shapes located between mineral patents, small parcels innocently occupied (for example, where a private home has been inadvertently built over a National Forest System property line), and road rights-of-way no longer needed.

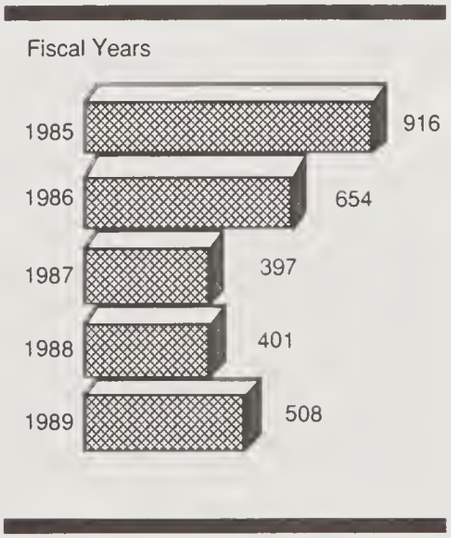
Land Purchases and Donations

The Forest Service purchased 113,101 acres of land and interests in land with money provided from the Land and Water Conservation Fund, receipts acts, and other appropriations. Landowners donated 961 acres of land and interests in land to the National Forest System. These lands help protect wildernesses, wild and scenic rivers, natural areas, critical wildlife habitat, and other special areas, and provide a wide range of recreational opportunities and open space.

Road Rights-of-Way

Through 641 separate transactions in 1989, the Forest Service acquired more than 500 miles of road rights-of-way, including 442 miles of existing roads, at a

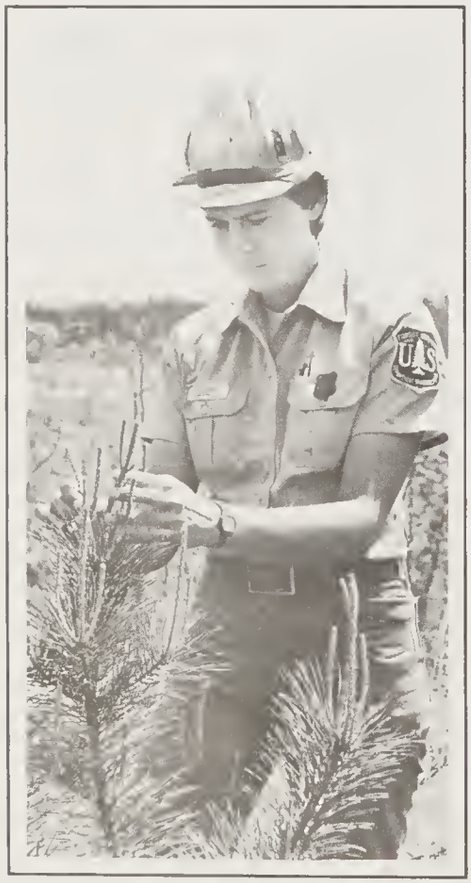
Miles of Rights-of-Way



cost of $494,270. Ownership of these rights will improve or protect access to the National Forest System for all users.

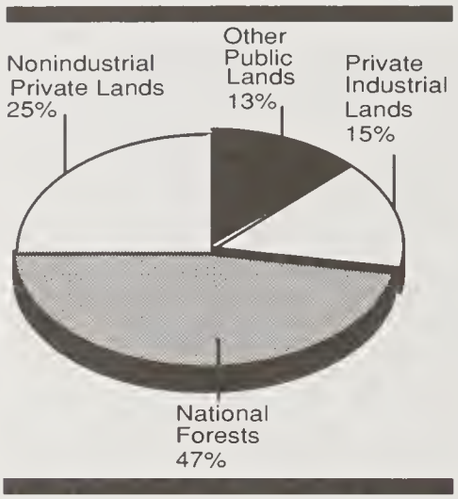
TIMBER

One of the Forest Service's charges is to help ensure a continuing supply of timber products to meet the needs of America's people. While the harvesting of timber products—logs for lumber and plywood, wood fiber for paper, fuelwood, posts, poles, and Christmas trees—is the obvious output of the timber management program, the total objectives of the timber program encompass a wider range of benefits. Some of these benefits include protecting and enhancing wildlife habitat, providing recreational opportunities, increasing wildlife and domestic forage, carrying out watershed improvement projects, reforestation, and improving tree genetics. In 1989, an all time record high of 492,200 acres of National Forest lands were reforested.



Forester examines new growth of Loblolly pine on the Sumter National Forest. Photo by Barry Nehr

Inventory of Standing Softwood Sawtimber Percent by Ownership



Inventory and Planning

The Forest Service annually inventories approximately 10 percent, or about 16.5 million acres, of its forested land for timber information. We use this information, together with information about other renewable resources, in developing Forest Plans and in writing the RPA Assessment. Each of the 123 national forest administrative units establishes allowable sale quantities (volume of timber that may be sold for harvest) and outlines timber management objectives, activities, and standards and guidelines for the next 10 to 15 years.

Old-Growth Timber

The management of old-growth forests was an important issue in 1989. There is controversy over the definition and inventory of old growth and over how much of the remaining old growth should be reserved from or made available for harvest. The Forest Service has taken several actions over the past year to address these issues. One action is the development of a national ecological definition of old-growth forests based on structural attributes that can be identified and measured. This definition will help develop definitions of old-growth by forest types and provide consistency throughout the Forest Service in identifying the extent and location of old growth.

Inventories were accelerated to provide interim estimates, by the end of 1990, of the amount of old growth remaining on 9 Westside national forests in Oregon and Washington, on adjacent national parks, and on 3 national forests in northern California. In addition, more intensive inventories are being accelerated for 17 national forests in California, Oregon, and Washington, which include the 12 forests undergoing the interim inventory. These inventories are designed to respond to varying definitions of old growth and will produce better information on the extent and location of spotted owl habitat.

This past year, a critical situation developed with the timber sale program in Oregon and Washington. It concerns the difficult choices that must be made to protect the northern spotted owl habitat in mature and old-growth forests. Because of a court suit involving the Chief's decision on the management of the spotted owl, no timber sales could be offered which included more than 40 acres of spotted owl habitat. This tied up over half of the planned sale program, approximately 2 billion board feet, in the two States.

Another important action is the development of a new national policy on old-growth management. The policy recognizes the importance of old growth on a national level and the many significant benefits associated with it. It states that a significant share of old-growth forests should be protected and managed for posterity. The policy includes general guidance on old-growth definitions, land-use decisions, silvicultural practices, and research.

The land and resource management planning process is the proper forum for determining how to provide old-growth benefits on each national forest. The Forest Plans, developed with much input from various public interests, will provide for old-growth areas that are consistent with public needs and our multiple-use charter.

A provision contained in the Department

Forester checks a core sample taken on the Panhandle National Forest.
Photo by DelMar Jaquish

of the Interior appropriations bill for 1990 is designed to protect the most significant stands of remaining old growth while allowing sales to be offered in the 13 owl forests. It provides for a combined 1989-90 sale level of 7.7 billion board feet of net merchantable volume for Region 6, including at least 1.1 billion board feet of the previously enjoined sales.

Silvicultural Examinations

Silvicultural examination is the process of obtaining the site and stand characteristics needed to identify existing stand conditions, capabilities, and trends. In 1989, 5.4 million acres were examined. Data from examinations are used to develop site-specific silvicultural prescriptions to meet multiple-use objectives on national forests.

Timber Sale Preparation, Offering, and Harvest

National forests provide 13 percent of the total wood volume harvested annually in the United States. This compares with 48 percent from nonindustrial private forest lands, 32 percent from lands owned by industry, and 7 percent from other public lands. Of the total amount of softwood lumber produced in this country, primarily for construction and the manufacture of paper, the national forests provide approximately 28 percent.

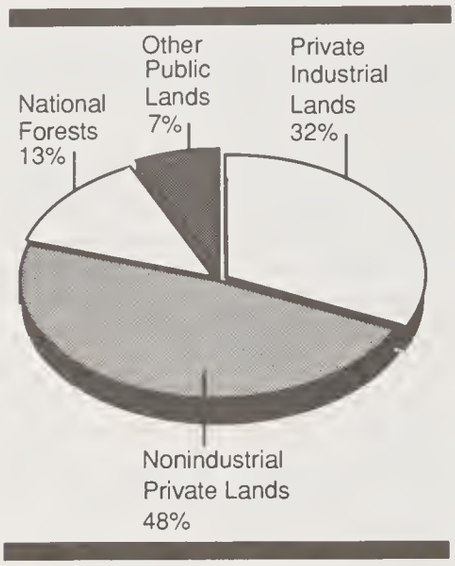
The Forest Service's timber sale program continues to bring in more money than it spends. In 1989, the cost of the timber sale program, including roads, was $477 million (table 20). The value of timber harvest in 1989 was $1,310 billion (table 12).

In 1989, the actual timber volume sold was only 8.4 billion board feet. The value of timber sold was $1.078 billion. This compares to 1988 sales of 11.0 billion board feet valued at $1.254 billion.

The 1989 accomplishment was 91 percent of the funded target for timber offered for sale. This reduction in accomplish-

The feller-buncher has added important mechanization to the harvesting of Southern forest products. This one (hydro-ax) cuts and bunches tree-length logs in one operation.
Photo by Robert Neelands

Percentage of Total Annual Wood Harvested from Lands in the United States



ment was primarily because of a court injunction over the spotted owl and appeals on individual timber sales. Compared with the levels established in the 1985 RPA Recommended Program, the 1989 accomplishment was 105 percent for timber offered in the Low Bound level and 91 percent in the High Bound level.

The average bid for timber in 1989 was $128 per thousand board feet, compared with $114 in 1988, $89 in 1987, $69 in 1986, and $52 in 1985. The increase in average bid reflects the continuing rise in timber demand and the reduction in available supply from the national forests.

The 1990 Appropriations Act requires that the amount of 1989 volume that was not sold because of lawsuits and conferencing with the Fish and Wildlife Service be made available for sale in 1990.

Volume harvested during 1989 dropped to 12.0 billion board feet, compared with 12.6 billion board feet in 1988 and 12.7 in 1987, which was the all-time record high. The value of timber harvested in 1989 was $1.310 billion, compared with $1.236 billion in 1988.

Preparation of timber sales is a complicated process that may take as long as 5 years from the initial concept to the award. To provide for the orderly flow of sales, the Agency strives to complete the field work a year ahead, including environmental analyses, volume estimates, and road surveys and designs. The only remaining work before the sale date is the appraisal and auction.

The process of planning and preparing all the timber sales over several years is referred to as the timber pipeline. For sales to be completed on time, a steady and uninterrupted supply of sales at various stages of preparation must be in the pipeline at any given time. In recent years, the Agency has needed to accelerate sales that were in process within the pipeline in order to meet its commitment to the sale quantities identified in the appropriations act. This acceleration was induced by unavoidable reductions in work forces during the reoffering of buyout timber sales, changes made necessary through appeals or litigation, the use of timber sale preparation crews to fight the excessive fires of 1987 through 1989, implementation of Land and Resource Management Plans, and new environmental concerns. To meet sale program commitments identified in the appropriations acts, it was necessary to have approximately 110 to 125 percent of the planned sale volume in the pipeline ready for sale in any particular year.

Entering 1989, the timber pipeline situation became acute, with only 35 percent of the sale program ready for appraisal and sale. This situation reduced the Agency's ability to offer substitute sales when necessary, and decreased its ability to meet the 1989 and following year's sale programs.

During 1989, the Forest Service and the purchaser of one of the Alaska long-term timber sales agreed to important contract modifications that will permit the adjustment of contract rates based on market trends. This provision, along with one previously included in the other long-term contract, will result in stumpage prices commensurate with other contracts in Alaska. Among other changes, the Forest Service will select and designate the timber to be harvested. Harvesting must be completed on existing units before new areas are made available.

Because of upward market trends and the unplanned reduction in 1989 sales, the volume of uncut timber under contract decreased to 17.9 billion board feet in 1989, down from 21.8 billion board feet in 1988 and 25.1 in 1987. The volume under contract includes sales conditionally extended as well as the volume from unresolved defaulted sales. It also includes some sales whose status remains unresolved during Title 7 bankruptcy proceedings. Long-term sale volume is included in the total as it is released for cutting.

Under the Federal Timber Contract Payment Modification Act of 1984, timber purchasers returned 1,578 sales containing 9,748 million board feet. In 1989, 442 million board feet was reoffered for sale. To date, 6,616 million board feet have been reoffered.

Salvage Sale Program

The National Forest Management Act authorizes the salvage sale program. The program allows the Forest Service to use money from salvage sales to cover the cost of preparing and administering the sale of insect-infested, dead, damaged, or downed timber including the engineering work needed for the roads to access or operate these sales.

In 1989, the Forest Service sold approximately 1,771 million board feet of salvageable timber through the salvage sale program. This represents approximately 91 percent of the total National Forest System salvage volume sold. Small timber operators with less than 25 employees purchased approximately 8 percent of the timber sold under the salvage sale program.

Large salvage sale offerings occurred because of large forest fires throughout the West for the past 2 years, insect attacks in the northern Rocky Mountain area and portions of the South, and tree mortality resulting from prolonged drought

SUMMARY OF TIMBER SALE BUY-OUT RETURNED AND REOFFERED VOLUME

Region	No. of Sales	Total Volume Returned (MMBF)	Total Buy-Out Charges Billed ($1,000)	Volume Reoffered in 1986 (MMBF)	Volume Reoffered in 1987 (MMBF)	Volume Reoffered in 1988 (MMBF)	Volume Reoffered in 1989 (MMBF)	Total Volume Reoffered to Date (MMBF)
1	112	665	9,108	132	144	76	74	426
2	13	33	328	5	5	4	0	14
3	26	166	1,758	16	49	52	0	117
4	17	40	464	2	30	1	7	40
5	226	1,997	43,009	293	337	191	226	1,047
6	991	6,627	112,718	1,798	1,579	1,297	135	4,809
8	136	202	2,607	69	80	0	0	149
9	57	18	185	4	9	1	0	14
10	0	0	0	0	0	0	0	0
	1,578	9,748	170,177	2,319	2,231 1/	1,622	442	6,614 1/

1/ Columns do not sum due to rounding. Totals shown are National totals.

HOW VALUES ARE CALCULATED

Value of Timber Products Sold. The value of timber products sold is an estimate of the amount the Forest Service expects to receive from the timber sale based on the bid rates. It does not include purchaser credit--the value of permanent roads built by purchasers. It includes all types of sales products and tree species.

Value of Timber Products Harvested. The value of timber products harvested is the adjusted amount paid by the purchaser at the time of harvest. The value does not include purchaser credit. The value of timber harvested from a sale may differ from the bid value because of price adjustment provisions in the contract and differences between estimated and actual volumes.

Money Received From Timber Products. Money that the Forest Service receives from the sale of timber products varies from reported harvest value because of the time delay between billing and receipt of payment.

in the Sierra Nevada Mountain areas of California. During the last days of September, Hurricane Hugo struck the Southern Region, producing an estimated 700 to 800 million board feet of windthrown timber, primarily on the Francis Marion National Forest. The Forest estimated that about 250 million board feet could be salvaged in the six months prior to significant reduction in the quality of the wood due to decay and insect attack.

Fuelwood

The amount of fuelwood removed from National Forest System lands continued the decline begun in 1982, when a high of 5.2 million cords of fuelwood were provided. In 1989, the equivalent of 1.3 million cords of fuelwood were sold or provided for free use, compared to 1.4 million cords in 1988.

The decline reflects both decreasing demand resulting from lower prices for oil and gas and the continuance on most forests of a charge permit program rather than a free-use program. The decrease in fuelwood consumption also may be related to higher employment levels, less discretionary time available to obtain fuelwood, and increasing concern for air quality in metropolitan areas and the related requirements imposed on wood burning stoves to meet clean air standards.

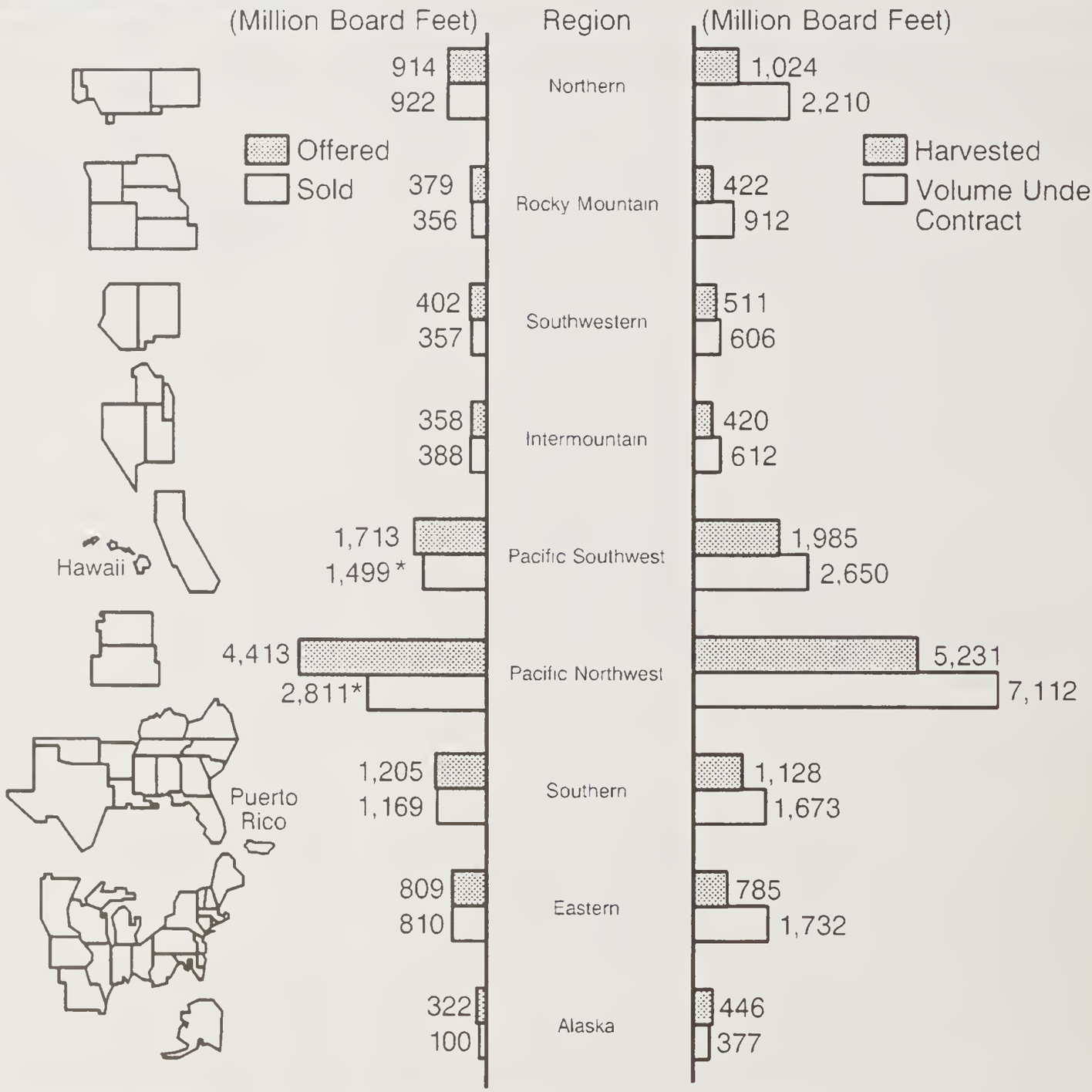
Excess Timber Receipts

The 1989 Department of the Interior and Related Agencies Appropriations Act (P.L. 100-446) designated that all timber sale receipts in excess of $791 million be made available to the Secretary of Agriculture for the purpose of achieving additional improvements in specific resources of the national forests. The amount of $97.5 million was in addition to those funded by regular appropriations.

The Forest Service was directed to carry

Timber Offered and Sold

Timber Harvested and Uncut Timber Volume Under Contract



Total Uncut Timber Under Contract - 17,884 Million Board Feet

*Appeals, litigations, and the Spotted Owl Temporary Restraining Order delayed the offer and award of 1.6 bbf of new sales in Region 6 and 0.2 bbf in Region 5

out projects that would return the highest public benefits in trail maintenance and construction, wildlife and fish habitat management, soil, water, and air management, cultural resource management, wilderness management, advanced sales preparation activities, and reforestation of fire damaged areas. The funds were to remain available until expended. Table 43 shows funding distribution and accomplishments for those resources that benefited from excess timber receipts.

At the end of 1989, the national forests had expended approximately 52 percent of the total funds. The remaining balance of $45.9 million will be expended in 1990.

Timber Management Administrative Review Process

The Forest Service remains committed to the review of forest officer decisions when requested by the public under the administrative review process that was initiated in the 1930's and codified as Federal regulations. During 1989, the process was streamlined to reduce both paperwork and the number of levels of review. The revision was deemed essential by the Agency because of the high number of appeals and the great workforce effort needed at all administrative levels to resolve them. Under the revised process, reviews of forest officer decisions are limited to the next higher administrative level. Further review is discretionary with the Agency. This processing improvement has accelerated the resolution of existing administrative reviews, and resulted in a reduced inventory of active administrative appeals to 30 to 40 timber sales, compared with 60 to 70 a year ago.

The Forest Service will continue to integrate timber sales and other timber management activities with the management of other resources. We will accomplish this in accordance with the National Environmental Policy Act, the National Forest Management Act, and the individual Forest Land and Resource Management Plans, and we will have appropriate citizen participation.

Suspension and Debarment

The Forest Service will not conduct business with unscrupulous timber purchasers, as mandated by the strengthened 1987 suspension and debarment regulation. Under this regulation, timber purchasers who are suspended or debarred may not bid on new timber sales and may not be awarded a timber sale contract during the period of suspension or debarment. The length of debarment can be up to 3 years. Debarment is for the public interest and for the Government's protection; it is not intended as punishment. Reasons for debarment include theft, forgery, bribery, falsification or destruction of records, false statements, receipt of stolen property, antitrust violations, and certain contractual violations.

During 1989, 23 companies and individuals were debarred, and debarment was proposed for one other individual. By the end of 1989, the suspension and debarment list contained 43 debarred companies and individuals, 1 proposed for debarment, and 6 suspended.

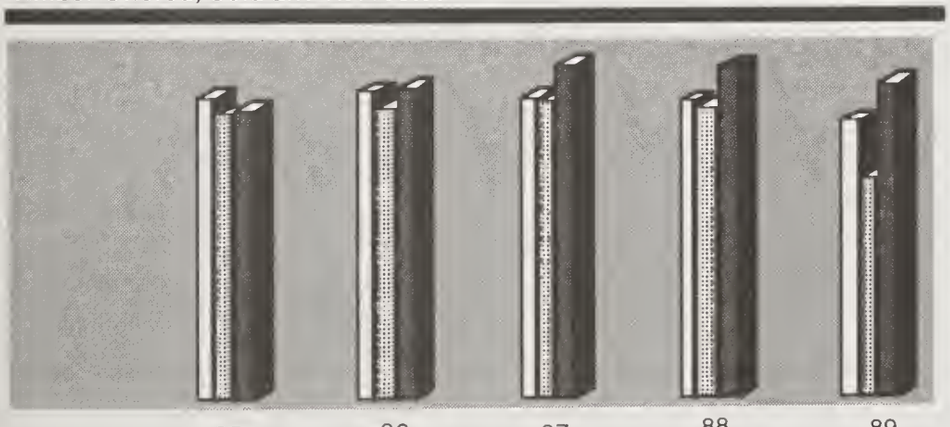
Reforestation

Reforestation of suitable forest land occurs through natural processes or the planting of seeds or nursery-grown seedlings. In 1989, a total of 497,200 acres were reforested. This is the largest number of acres reforested in one year by the Forest Service. The increased level of reforestation is primarily due to the record harvest levels of the past two years. Appropriated funds, Reforestation Trust funds, and carryover funds accomplished 148,600 acres. Knutson-Vandenberg Act funds were used to reforest 327,300 acres and 16,300 acres were reforested naturally or by contributions from other sources. The total number of seedlings planted on the national forests by all funds was 152 million.

Even with this increased reforestation, national forest lands needing reforestation increased from 1,176,000 acres in 1988 to 1,225,000 acres in 1989. The increase is attributed to the need to reforest 70,000 acres burned by wildfire in 1989 (tables 21 through 23).

Over the last 5 years, an average of 90 percent of all reforestation treatments has successfully met stocking objectives. In 1988 (the latest year for which data are

Timber Offered, Sold and Harvested



	85	86	87	88	89
	(Billion Board Feet)				
Offered	11.5	11.7	11.5	11.3	10.5
Sold	10.8	11.0	11.3	11.0	8.4[1]
Harvested	10.9	11.8	12.7	12.6	12.0

[1] Appeals, litigations, and Spotted Owl Temporary Restraining Order delayed the offer and award of 1.6 BBF of new sales in Region 6, and 0.2 BBF in Region 5.

available), the reforestation success rate was 93 percent. This reforestation success rate was the same as 1987 and 2 percent above 1986.

The average cost of all reforestation in 1989 was approximately $342 per acre (appropriated $385 and Knutson-Vandenberg $323). The 1989 cost was approximately 15 percent less than in 1988, reflecting greater treatment of fire damaged areas.

Nursery Operations

Eleven bareroot and two container nurseries produce high quality seedlings to meet reforestation needs cost effectively. These nurseries must produce seedlings that meet the species and seed-source requirements specific to the individual areas to be reforested.

Seedling production costs at ten of the nurseries are charged to the working capital fund and are in turn repaid as a cost of seedlings in the reforestation program. Annual production during the past 10 years has averaged 128.7 million bareroot and 5.7 million container seedlings. Production during 1989 was 120.4 million bareroot and 5.2 million container seedlings.

Forest Service seedling production is supplemented through contracts with State and private nurseries, which averaged 31.3 million seedlings per year over the past 10 years and 42.4 million during 1989. The combined production of bareroot seedlings and containerized stock will be approximately 130 million seedlings for the 1990 program.

Timber Stand Improvement

A total of 348,500 acres received timber stand improvement treatment. The Forest Service used appropriated and carryover funds to treat 196,900 acres, contributed funds to treat 3,200 acres, Tongass Timber Supply funds to treat 2,300 acres, and Knutson-Vandenberg Act funds to treat the remaining 146,100 acres (tables 24 through 26).

Several types of noncommercial treatments can improve tree growth and quality. We can increase the future usable yield of timber stands from 15 to 25 percent by thinning overly dense stands, eliminating competing shrubs or weed trees (referred to as "release"), and applying fertilizer to stimulate tree growth. As of October 1, 1989, the Agency has prescribed timber stand improvement treatment to maintain healthy, vigorous growth for approximately 1.65 million acres, including reforested stands.

The average cost of all timber stand improvement treatments in 1989 was approximately $168 per acre (appropriated $162 and Knutson-Vandenberg $175). The 1989 cost was approximately 25 percent higher than 1988 largely because the highest cost Regions accomplished a larger percentage of the job, reduced herbicide treatment on competing vegetation, and higher contract rates. The shift of personnel to firefighting led to a reduction of the Knutson-Vandenberg Act timber stand improvement accomplishment and a corresponding reduction in expenditures.

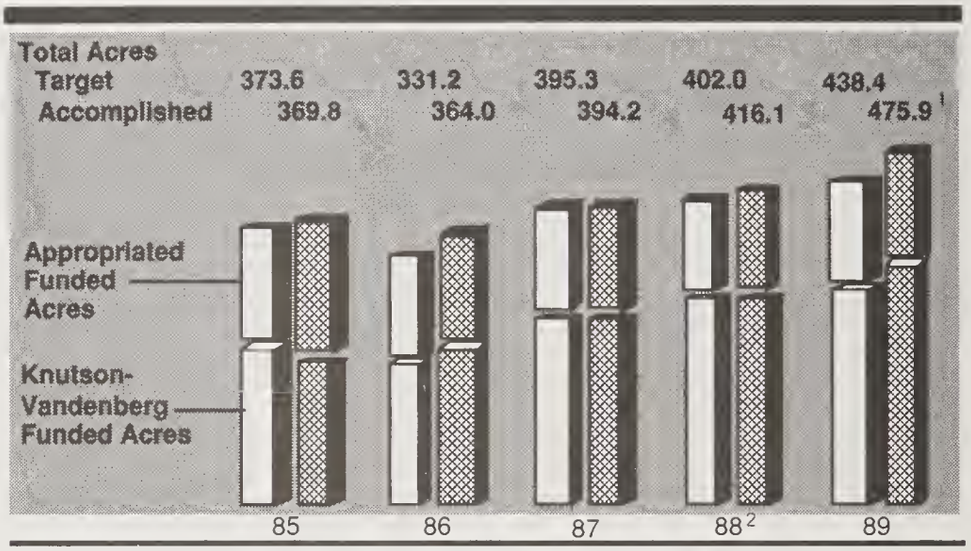
Tables 21 through 28 provide detailed information on needs, accomplishments, and the certification of reforestation and timber stand improvement.

Forest Tree Improvement

The tree improvement program selects trees with superior growth or disease-resistance characteristics, such as breeding stock, to produce seed for improved seedlings for the Forest Service planting program. Timber yields should be at least 10 percent greater on lands reforested with genetically improved planting stock.

The Forest Service has selected more than 2,090 superior trees, planted 737 acres of seedling tests to evaluate the genetic worth of the selections, and established 280 acres of seed orchards to

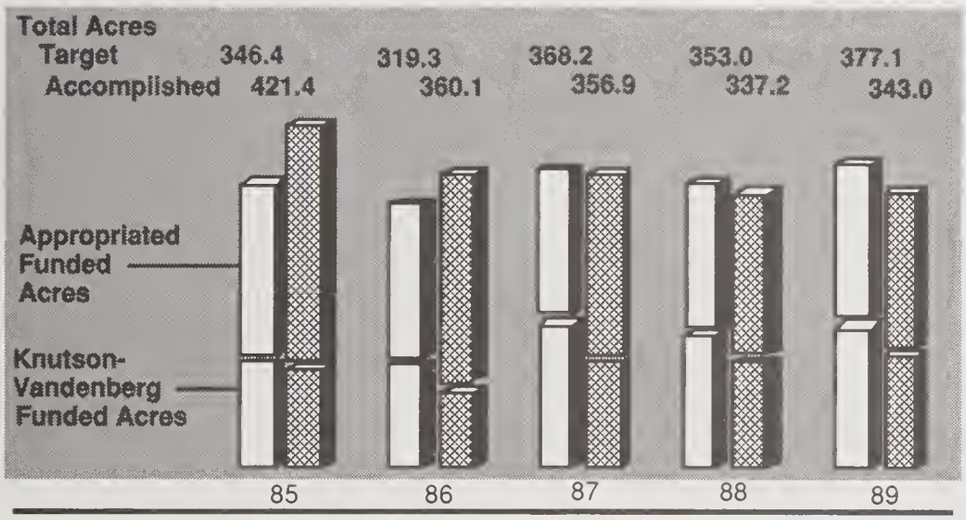
Reforestation



	85	86	87	88 [2]	89
Target					
Appropriated	157.6	138.7	139.7	119.0	142.1
K-V	216.0	192.5	255.6	283.0	296.3
Accomplished					
Appropriated	175.2	148.9	139.4	133.3	148.6
K-V	194.6	215.1	254.8	282.8	327.3

[1] An additional 16,350 acres were accomplished with contributed funds and were included in table 22.
[2] Does not include 36,800 acres of natural regeneration without site preparation.

Timber Stand Improvement



(Thousand Acres)

	85	86	87	88	89
Target					
Appropriated	214.4	188.4	185.8	187.0	197.6
K-V	132.0	130.9	182.4	166.0	179.5
Accomplished					
Appropriated	300.5	259.4	222.7	199.0	196.9
K-V	120.9	100.7	134.2	138.2	146.1

*An additional 3,278 acres were accomplished with contributed funds and were included in table 25.

produce improved tree seed. More than 11,600 pounds of seed harvested in seed orchards this year made up 19 percent of the total amount of seed collected. During 1989, 26 percent of the acres artificially regenerated were planted with improved seedlings grown from seed orchards.

Hurricane Hugo destroyed one seed orchard on the Francis Marion National Forest in South Carolina; however, all available cones were collected from the damaged trees. Cones also were collected from natural stands in the area to provide seed for reforesting the areas that were blown down.

In February 1988, the Forest Service established an electrophoresis laboratory at the Placerville Nursery on the Eldorado National Forest in California. The new laboratory processes seeds and tree samples to provide forest personnel with genetic information about relative amounts and geographic patterns of natural variation. Test results at the laboratory have enabled forest managers to evaluate the genetic consequences of stand management practices and tree improvement activities. Forest personnel have access to new quality control measures for many aspects of their continuing programs. We are investigating nine specific problems.

Timber Sale Program Information Reporting System (TSPIRS)

Following direction from the Congressional Appropriations Committee's 1985 Conference Report, the Forest Service established a task force to develop, field test, and evaluate costs and benefits of the timber sale program. We presented a final report on the development of the Timber Sale Program Information Reporting System (TSPIRS) to Congress in April 1987. The report reflects, among other things, a revised financial accounting system developed in conjunction with the General Accounting Office. In response to a separate request by the House Appropriations Subcommittee on Interior, the General Accounting Office independently established baseline costs and accrual accounting procedures in addition to other important economic information about the annual sale program. TSPIRS contains the following three basic accounts to display this information:

- The Statement of Revenues and Expenses—the financial statement presented in the General Accounting Office report to Congress.
- The Employment, Income, and Program Level Account—the effect of employment, income, and program output levels on local communities.
- The Economic Account—from an economic perspective, the short- and long-term costs and benefits, including both market and nonmarket values, associated with the annual program.

Every national forest tested the system in 1987 and 1988, and in 1989, every national forest officially implemented the reporting system (see tables 16, 17 and 18 for results). The test results were used to refine system design into the format and procedures used for developing the 1989 report. As with any new and continuing reporting system, TSPIRS will be modified and updated as improvements are identified.

RECREATION

The national forests, including the 79 percent of the wilderness system outside the State of Alaska, provide more outdoor recreational opportunities and record more recreation visitor use than any other Federal lands. The Forest Service trail system is the largest in the Nation, with more than 108,381 miles of trails on which to hike, ride, or cross-country ski. The national forests have 3,338 miles of the National Wild and Scenic Rivers System, 14 national recreation areas, and many geologic, scenic, and botanical areas. The forests also contain many valuable historic and prehistoric archeological resources. More than 4,400 campgrounds and 1,400 picnic grounds comprise our developed facilities.

The National Forests provide information about these recreation opportunities at 50 major visitor centers and at hundreds of Forest Service offices throughout the United States. In cooperation with the private sector, the forests provide more than 40 percent of the downhill skiing in the Nation, as well as sites for many lodges, resorts, and more than 15,000 summer homes.

National Recreation Strategy

In 1988, the Forest Service launched the National Recreation Strategy to improve the effective use of recreation opportunities on the National Forest Systems lands. The objectives were to improve customer service and satisfaction in providing and managing recreation sites and facilities, to form partnerships with other agencies and private enterprise, to improve employee training in all phases of recreation management, and to increase public awareness of multiple-use management of public lands. In 1989, we continued to implement the strategy. Employee and customer response has been excellent.

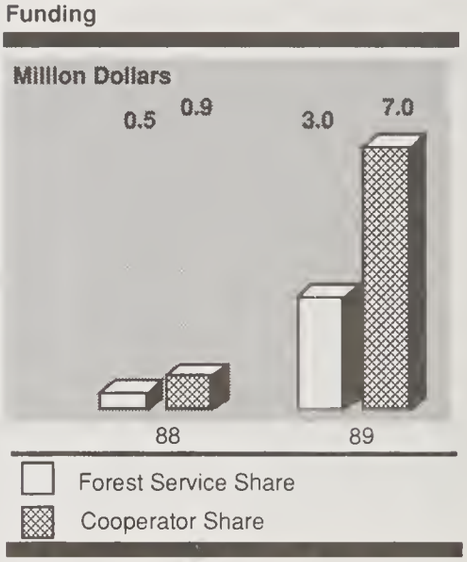
The strategy calls for developing several demonstrations for national forest marketing plans. These plans focus on customer satisfaction and emphasizing the importance of serving people in urban areas near national forests. The Forest Service designed a national reservation system for recreation customers seeking public camping facilities. We continued developing the "Windows on the Past" program to make more cultural resources available to the public for enjoyment and education. We rehabilitated and made more recreation facilities accessible to older Americans and the disabled. We also have identified administrative barriers to implementing the strategy.

The Forest Service designated $3 million for the Challenge Cost-Share Program in 1989. The Agency found partners who provided more than $7 million for recreation improvement projects. Thus, more than $2 were contributed for every $1 appropriated for the program. The partners included local, county, State, and Federal agencies, private interest groups, senior citizens, disabled youths and veterans, correction facility inmates, students, utility companies, recreation industries, timber operators, interpretive associations, and private businesses. These partnerships stretched the limited Federal funding to help meet the recreational needs of the Nation.

Recreation Use

In 1989, recreationists spent 252.5 million visitor days (RVD's) on National Forest System lands, a 4-percent increase over 1988. This 1989 use exceeded the RPA 1985 High Bound estimate for 1989 by 3 percent (table 4). Recent data show that the national forests and grasslands account for 39 percent of the total RVD's of use that takes place on Federal lands—more outdoor recreation than on any other Federal landholding.

Recreation Challenge Cost-Share Funding



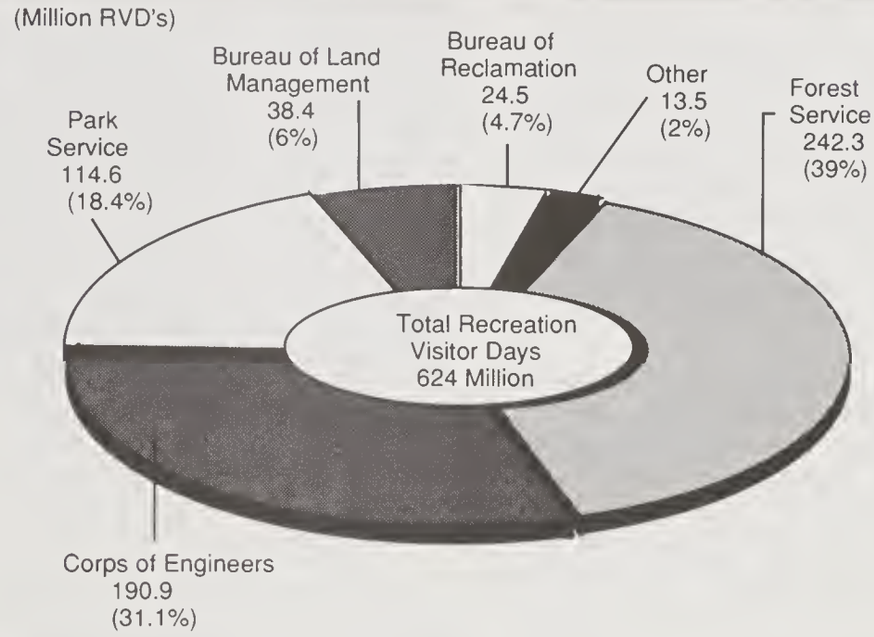
In 1989, national forest campgrounds, picnic areas, and swimming sites had 72.3 million RVD's. This amounted to approximately 29 percent of total National Forest System recreation use. Facilities operated by other public agencies or the private sector on National Forest System lands, such as ski areas and vacation

Customer satisfaction is emphasized with the National Recreation Strategy.
Photo by Peter Wingle

cabins, accounted for an additional 13 percent of total visitation.

National forest recreation includes a wide spectrum of activities. There are 360,000 miles of road and extensive trail systems for motorized vehicles that provide access to these activities (tables 29 and 30). Most national forest visitors used these lands, roads, and trails for unstructured, dispersed recreation, such as hiking, hunting, and driving for pleasure. This use accounted for an equivalent of 148 million RVD's, or approximately 59 percent of total use. Five percent of the total use of 11.6 million RVD's occurred in wilderness and primitive areas.

1988 Recreation Visitor Days by Federal Agency*



*1989 Agency data not yet available.

Receipts

Total recreation receipts in 1989 were $38 million, an 11-percent increase over 1988. Appropriations for recreation were $151.9 million. Fees, therefore, recovered 25 percent of total recreation costs. Fees for the use of national forest recreation facilities generated $14 million in 1989, compared with $12.5 million in 1988 and $11.1 million in 1987. Fees for recreation special uses, derived primarily from ski areas and recreation residences, generated $24 million, compared with $21.8 million in 1988.

During the summer of 1989, the Middle Park Ranger District, Routt National Forest, completed the William Fork Boardwalk challenge cost-share project in cooperation with fourteen public and private organizations. Photo by Peter Wingle

In 1989, 43 interpretive associations contributed an estimated $3.2 million to the national forests from gross sales of $4.7 million, primarily from the sale of books and maps. Interpretive associations are nonprofit, public service organizations established to further the interpretation and understanding of resource management on the national forests. The services of these associations include visitor center staffing, map and book sales, the preparation of many publications, and the purchase of equipment for interpretive programs.

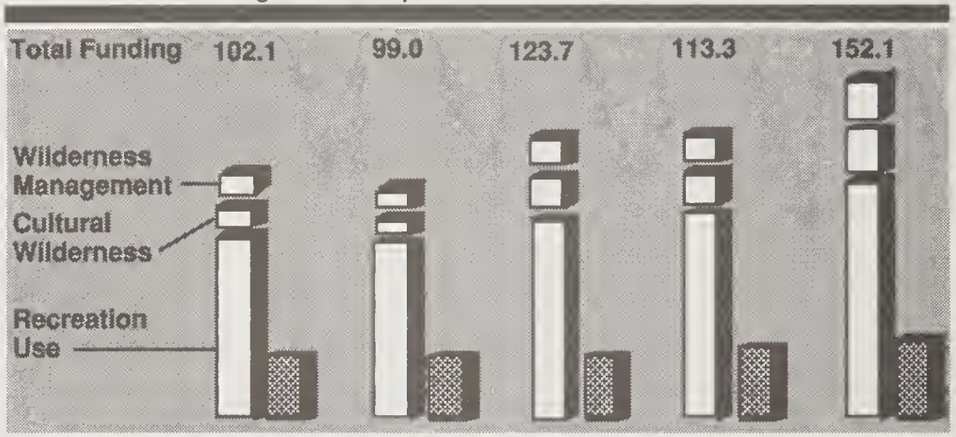
Trails

The national forest trail system provides opportunities for horseback riders, hikers, motorcyclists, snowmobilers, bicyclists, and disabled visitors. The trail system

also serves resource management activities as wildfire suppression and wildlife habitat improvement (table 31). The Forest Service constructed or reconstructed 1,724 miles of trails, compared with the funded target of 1,328 miles. Most of this work involved the reconstruction of existing trails, rather than new construction. In addition, we constructed 220 miles with the contributed efforts of volunteers, the Youth Conservation Corps, the Senior Community Service Employment program, and others.

The total trail system now has 108,381 miles, an increase from 95,348 in 1975. We have been building new trails and reconstructing existing trails to take advantage of scenic vistas and historic sites, to create loop trails, to provide diverse experiences, and to provide urban residents with access to their national forests. Today, trail use accounts for approximately 8 percent of the total national forest recreation use and is a cost-efficient recreation capital investment.

Recreation - Funding and Receipts



(Million Dollars)

	85	86	87	88	89
Funding					
Wilderness	7.8	7.5	10.3	12.6	19.6
Cultural Resources	9.6	9.3	9.7	14.2	20.9
Recreation Use	84.7	82.2	93.3	96.9	111.6
Receipts	30.8	30.3	30.6	34.3	38.0
Receipts as Percent of Funding	30.2	30.6	27.0	27.7	25.0

Visitors enjoy a walk on one of the many trails on the Pisgah National Forest.
Photo by Jill Bauermeister

A national "Tread Lightly" program was established to educate motorized users of trails and primitive roads in proper use of public lands. This program has received strong endorsement from organized off-highway vehicles users, vehicle manufacturers, and public land managing agencies. The "Tread Lightly" program is rapidly becoming accepted as a critical component of conservation code of ethics for off highway vehicle recreationists.

The General Accounting Office report, "Maintenance and Reconstruction Backlog on Forest Trails" (GAO/RCED-89-182), was completed in 1989 and estimates a backlog of $195 million in needed trail reconstruction or maintenance. This backlog has resulted from increased use, weathering, and the postponement of routine maintenance.

Scenic Byways Program

In 1988, the Forest Service designated its first national forest scenic byway. The program identifies travel routes that trav-

erse scenic corridors with outstanding aesthetic, cultural, or historical value. Scenic byways offer recreational motorists a natural spectrum of typical forest settings, ranging from dense rain forests to northern hardwoods to mountain tundra and alpine forests. This program draws attention to the spectacular scenery of the national forests and provides opportunities for visitors to view well-managed and changing forest landscapes in harmony with forest activities.

Scenic byways have increased dramatically since 1988, from 10 to 53 in 1989. The total length of the byways along scenic highways increased from 560 miles in 1988 to 2,937 miles in 1989. Scenic byways have now expanded from 7 to 27 States.

In 1989, the Forest Service entered a partnership with the Plymouth Division of Chrysler Motors to promote the scenic byways. Chrysler will help fund Forest Service improvements at scenic byway turnouts across the Nation. The Forest Education Foundation, a nonprofit, tax-exempt organization which supports expanded recreational opportunities on public lands, will provide program supervision. The Foundation served as a catalyst in forming the Forest Service/Plymouth partnership.

Recreation Facility Management

We initiated a campsite reservation service on May 1, 1989, and it has received favorable response. The reservation service allows campers to make advance reservations at some of the campgrounds that charge user fees. Reservations can be made year-round through toll-free telephone requests and mail-in reservations. A private company, which charges a reservation fee of $6 for family units and $10 for group units in addition to the normal user fee, operates the service. The company retains the reservation fee.

Historically, as national forests became more heavily used, the Forest Service built recreational facilities to protect resources and settings and to accommodate visitors. These facilities include campgrounds, trailheads, boat ramps, picnic areas, and visitor information centers. The majority of the recreation facilities are more than 21 years old. These recreation facilities have a combined capacity for 158 million persons-at-one-time (PAOT) days. PAOT days are determined by multiplying a site's designed capacity by the number of days per year that a site is available for use. In 1989, the Forest Service provided 120.9 million PAOT days, with another 9.7 million PAOT days contributed by human resource programs and Challenge Cost-Share Program projects. The total figure, 130.6 million PAOT days, is an increase of 1.3 million PAOT days over 1988.

Deferred facility maintenance continues to reduce the quality of facilities and the satisfaction of visitors. This backlog constitutes a potential loss in the utility of major capital investments in recreational facilities. The deferred maintenance backlog reported for 1989 was $319.1 million.

Recreation Site Construction

In 1989, Congress appropriated $24 million for recreation construction. The Forest Service used most of these funds to provide for high-priority recreational facility rehabilitation projects as identified in Forest Land and Resource Management Plans, with emphasis on health- and safety-related projects, such as water and sanitation reconstruction. The objective of this rehabilitation is to increase receipts and recreational opportunities.

Cultural Resource Management

The Historic Preservation Act of 1966 directs the Forest Service to identify and protect significant cultural resource properties during land-disturbing activities. In addition, the act charges the Forest Service with managing these resources in the public interest and for the benefit of the public. To meet this direction, we conduct surveys to identify and evaluate cultural properties before proposed projects are approved. During 1989, we completed cultural surveys on 1.5 million acres and identified almost 12,000 historic or prehistoric properties. Of this number, we determined approximately 2,000 to be significant, while another 8,000 remain to be evaluated for their importance. We submitted 37 important cultural proper-

The Forest Heritage Scenic Byway follows a 79-mile loop through the mountain valleys and rural countryside on the Pisgah National Forest. This byway features attractions such as the Cradle of Forestry, Looking Glass Falls, and Sliding Rock. Photo by Jill Bauermeister

ties to the National Register of Historic Places for listing.

To meet the Agency's responsibility for managing cultural resources for the benefit of the public, the Forest Service began a program called "Windows on the Past," whose goals are to:

- Create recreational opportunities for forest visitors.
- Develop an awareness about our cultural resources.
- Instill a feeling of public responsibility to protect our prehistoric and historic sites.
- Develop partnerships and volunteerism.

Since the start of the program, we have undertaken dozens of projects of all sizes and thus stabilized and protected historic cabins, lighthouses, bridges, and archeological sites. Thousands of person-hours have been contributed toward preservation and enhancement projects. Hundreds of new recreational and educational opportunities are now available on the national forests for the enjoyment of visitors.

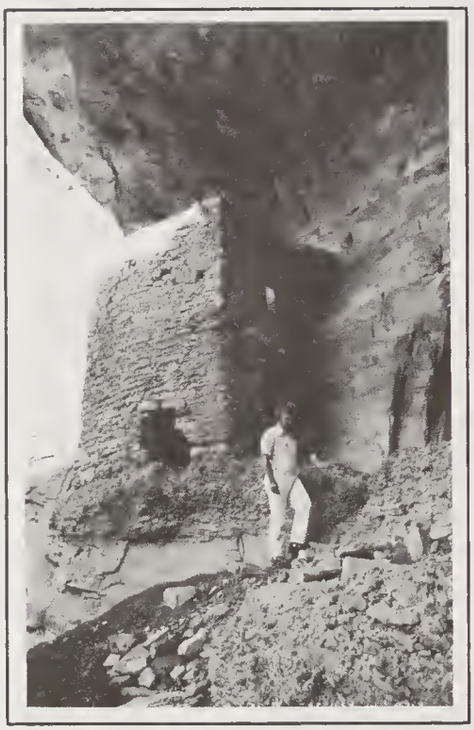
WILDERNESS

Congress has designated 32.5 million acres of the National Forest System to be managed as part of the National Wilderness Preservation System. There are 354 wilderness areas on national forests in 36 States, with a total land area about the size of Alabama. Currently, 1 acre in 6 of National Forest System land is managed as wilderness.

Our congressional mandate is to preserve an enduring resource of wilderness, where natural processes are allowed to operate freely and people are visitors who do not remain. Wilderness management provides for scientific, scenic, educational, conservation, historical, recreational, and other uses that are consistent with wilderness resource protection. We protect such wilderness characteristics as solitude, unconfined opportunities for recreation, and experiencing land with its natural resources in its primeval state.

To protect the wilderness resource, the Forest Service:

- Educates users on wilderness benefits and how to protect them.



Anasazi cliffhouse on the Monti-LaSal National Forest in southeastern Utah.
F.S Photo

- Enforces regulations established to protect wilderness.
- Rehabilitates damaged areas.
- Maintains inventory data for wilderness uses and resource conditions.
- Prepares and implements plans based on inventory data for protecting the wilderness for future generations' use and appreciation.

A total of 11.6 million RVD's were recorded in wilderness areas in 1989. This is approximately 5 percent of the recreation use on national forests. Hunting, fishing, and trapping under applicable State and Federal laws are allowable recreational uses within national forest wilderness areas. Other allowable uses are outfitting and guiding services; management measures to control fire, insects, and disease; aircraft and motorized use where it existed before and is specified in the designating legislation; adequate access to private and State lands; scientific data collection, using methods compatible with protecting wilderness environment; livestock grazing that occurred before designation; and mineral exploration and development under specific legal situations.

The 25th anniversary of the Wilderness Act was celebrated in 1989, with activities focused on increasing public awareness and appreciating wilderness and "leave no trace" concepts. Most local events were planned together with conservation groups and other agencies and included booths at county and State fairs, seminars, "Wilderness Day" activities, interviews with local media, and dedications of newly established wildernesses. An interagency National Wilderness Conference in Minneapolis drew 600 attendees. The Forest Service and the Izaak Walton League co-sponsored the first annual National Wilderness Education Award, with first place being awarded to an ingenious series of signs outside the Mt. Jefferson Wilderness that have "leave no trace" messages for wilderness users.

The Forest Service is placing greater emphasis on managing nonrecreational resources of wilderness. We reviewed prescribed natural fire management criteria in 1989. Many National Forests have written the "air-quality-related values" for the 88 Class I wilderness areas protected by the Clean Air Act of 1977. We started a national study on the effects of aircraft noise on wilderness visitors. The General Accounting Office released a report on national forest wilderness management, recommending that the Forest Service develop baseline inventory information and monitor changes, evaluate administrative sites, establish uniform national policy for outfitter and guide structures and facilities, determine total funding and staffing needs, and apply the Limits of Acceptable Change process more widely.

WILDLIFE AND FISH

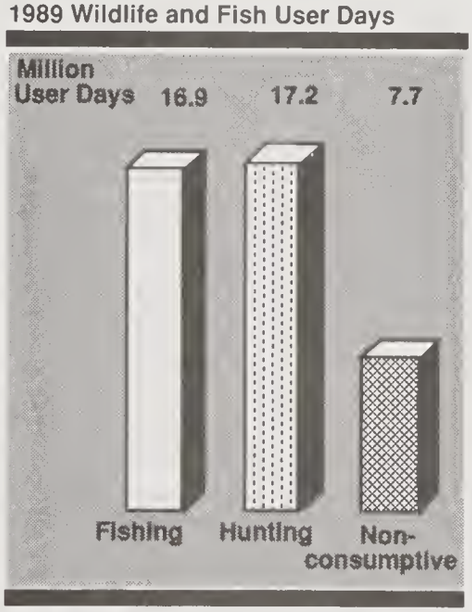
The National Forest System contains the greatest diversity of wildlife, fish, and plant species of any single land ownership in the country. Our goals are to maintain ecosystem diversity and productivity to ensure a quality environment and respond to demands for recreational and commercial uses of fish and wildlife. The Forest Service accomplishes these goals through a variety of techniques to protect, restore, and improve plant and animal habitats within the National Forest System.

Wildlife and fish resources of the National Forest System provided over 41 million user days of recreation for hunters, anglers, and nonconsumptive wildlife and fish users. This represents about 17 percent of all recreation on national forests. We obtained user days for fishing and hunting from recreation information management data and values for nonconsumptive user days from the 1985 Fish and Wildlife Service Survey. According to RPA Recommended Program information, the value of hunting provided on national forests is estimated at $482 million, the value of fishing at $360 million, and the value of nonconsumptive wildlife and fish uses at $178 million. Congress appropriated $64.9 million in 1989 for management to sustain or increase these benefits.

The Forest Service cooperates with State fish and wildlife agencies in developing and implementing statewide comprehensive plans to manage animal populations. The Forest Service manages habitat for several purposes: to produce game species, to protect endangered species, to enjoy nongame species, and to benefit all types and groups of national forest users.

Sound habitat management sustains the biological diversity of the Nation's major forest systems. It provides for recovering populations of threatened and endangered species; maintaining viable populations of all native vertebrates; protecting special habitats, such as selected old-growth forest, riparian areas, trout streams, snags, and wetlands; and ensuring the productivity of selected species, such as elk, deer, turkeys, bass, and salmon, for recreational and commercial uses.

1989 Wildlife and Fish User Days



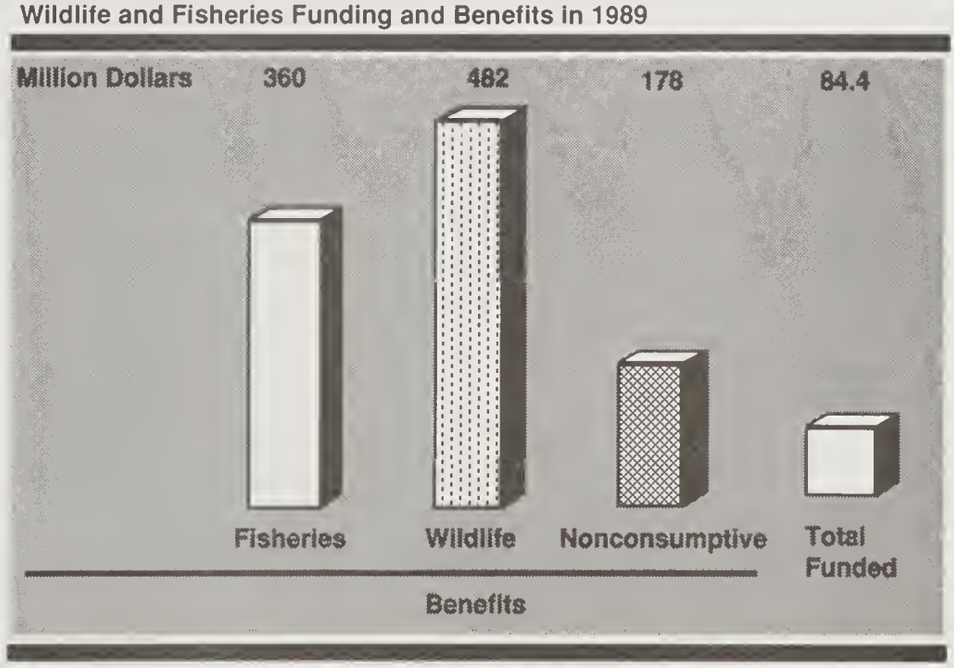
We develop conservation programs jointly with State wildlife agencies and important fisheries and wildlife conservation groups. Examples of programs are "Join Us," an initiative to strengthen public-private partnerships in wildlife and fisheries management; "Rise to the Future," a national fishery initiative to provide emphasis on fisheries habitat enhancement; "Taking Wing," a waterfowl and wetland initiative to enhance habitat and support the North American Waterfowl Plan; and "Animal Inn," a program to communicate the importance of managing dead standing and fallen trees for wildlife habitat.

This year, we organized a National Task Force to publicize Forest Service conservation and recovery efforts of sensitive, threatened, and endangered species.

Wildlife and Fish Habitat Improvement

Forest Plans call for increases in wildlife and fish habitat productivity to meet growing demands for recreational, commercial, and subsistence uses. During 1989, the Forest Service managed habitats in concert with other resource programs to maintain current levels of wildlife and fish production. We used appropriated funds to improve 115,164 acres of wildlife habitat, which was 44 percent above the funded target. We exceeded the funded level inputs through successful partnership efforts such as the Challenge Cost-Share Program. We used Knutson-Vandenberg Act funding from timber harvest receipts—a significant source of funds for wildlife and fish habitat management—to restore or improve the quality of an additional 192,262 acres of habitat affected by timber harvest.

Wildlife and Fisheries Funding and Benefits in 1989



What follows are some examples of habitat improvement activities that the Forest Service accomplished in cooperation with States and other Federal agencies and conservation organizations.

Elk Habitat. For the third year, the San Juan National Forest, in cooperation with the Colorado Division of Wildlife and the Rocky Mountain Elk Foundation, improved elk habitat in Disappointment Valley. The objective is to increase winter range capacity through prescribed burning on national forest lands in an attempt to reduce damage to private lands and maintain current elk populations.

Trumpeter Swan Project. The Forest Service undertook this cooperative multiagency project to inventory and describe habitat requirements, nesting success, and population trends for trumpeter swans in the Copper River Delta on the Chugach National Forest in Alaska. Our partners were the Fish and Wildlife Service and the University of Minnesota. The objective was to identify management opportunities that will reduce the current downward trend of the trumpeter swan population on the Copper River Delta.

Walk-in Hunting Area. On the Ozark-St. Francis National Forests in Arkansas, the Forest Service, in cooperation with the Arkansas Chapter of the National Wild Turkey Federation and the Arkansas Game and Fish Commission, is making efforts to diversify turkey hunting experiences and reduce the likelihood of conflicts between hunters. Specifically designated and managed walk-in hunting areas will provide an opportunity to hunt turkeys in areas relatively undisturbed by vehicular traffic; the areas also will be available for management activities to improve turkey habitat. Approximately 80,000 acres have been proposed for walk-in status and will be distributed throughout the forests in segments of varying size.

Warm Water Fisheries. Fish cover and spawning gravel bed structures were installed in Davis Lake and Brentes Lake on the National Forests of Mississippi. These lakes are bass and bluegill fisheries with a surface area of 200 and 50 acres, respectively. Structures were made of concrete blocks, tires, and tree tops. This project resulted in large fish being caught and a doubling of catch per unit effort. Cooperators include the Forest Service, the Mississippi Department of Wildlife, Fisheries and Parks, the Chickasaw Bass Club, and Lunker's Unlimited Bass Club.

Cold Water Fisheries. Thirty-four structures were installed along the Big Wood River, Sawtooth National Forest, to protect the surrounding floodplain, associated riparian areas, and private properties. They also protect and enhance the fishery habitat and recharge groundwater. This cooperative project received the President of the United States Award for Taking Pride in America and the Governor of Idaho Award for Taking Pride in Idaho in 1988. Cooperators included the Forest Service, the Bureau of Land Management, Friends of the Big Wood River, the Idaho Transportation Department, the Idaho Department of Fish and Game, and private land owners. Contributed funds from these partners exceeded $100,000.

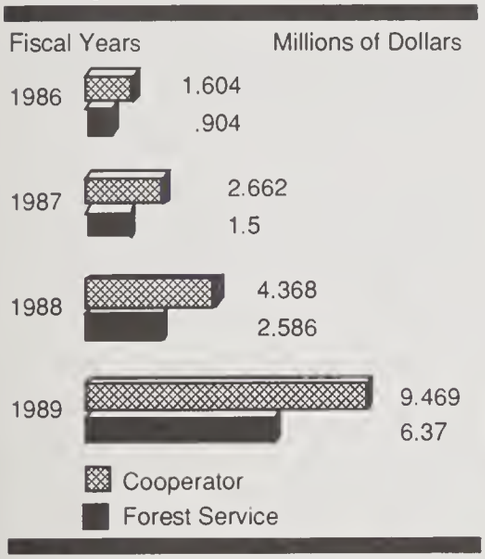
Anadromous Fisheries. Stream habitat conditions were greatly improved at Port Camden, Peterburg Ranger District on the Tongass National Forest in Alaska, for access and spawning success for fall chum salmon. This project will add 100,000 additional chum salmon to the southeast Alaska commercial and subsistence fisheries, resulting in an annual value increase of $300,000 commercial harvest. Cooperators include Trout Unlimited, the Alaska Department of Fish and Game, the Northern and Southern Southeast Region Aquaculture Association, the Southeast Alaska Guidance Association, Alaska Pulp Corporation, and the Forest Service. Contributed funds were $113,000.

An employee from the Arapaho-Roosevelt National Forest tests the new handicapped access fishing area at Middle Fork on the Saint Vrain River. Her comment, "It's great, I love it!" Photo by Don Virgovic

Partnerships for Habitat Improvement The Challenge-Cost Share Program

Congress authorized $3 million in 1989 to continue the fish and wildlife Challenge Cost-Share Program. The goal of this

Wildlife Challenge Cost-Share Funding



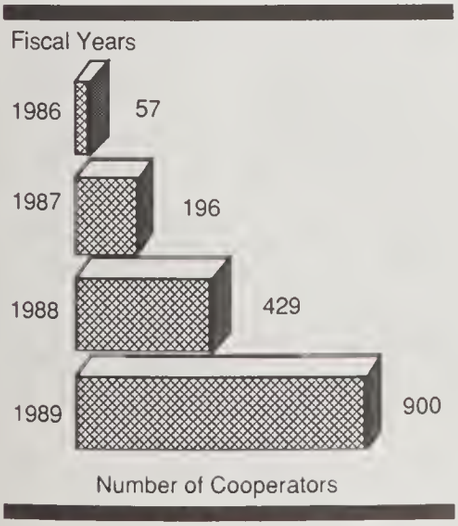
program is to maintain and enhance wildlife and fish resources on National Forests through active partnerships with conservation organizations, State and Federal agencies, and private individuals. The Challenge Cost-Share Program projects included improving forest habitat for game species such as deer, elk, grouse, moose; nongame species such as songbirds; improving several thousand miles of fisheries habitat; reintroducing peregrine falcons; building nest boxes; seeding around waterholes for wildlife food and cover; installing bass spawning boxes; and conducting surveys to establish protective measures for endangered species.

This year saw a substantial increase in both the amount and types of partnerships developed through this program, including many conservation groups, civic groups, corporations, and private individuals. The Boy and Girl Scouts of America, Rocky Mountain Elk Foundation, Trout Unlimited, the National Wild Turkey Federation, and various State fish and wildlife departments are examples of Forest Service partners in this program. Partners for 1989 numbered approximately 900, an increase of more than 100 percent over last year's participation. These talented partners were able to turn their efforts into an investment of more than 9.4 million—a ratio of more than 3 to 2 challenge cost-share dollars appropriated. This translates into a savings for the American taxpayer and also into substantial benefits to both the national forest users and to the fish and wildlife resources.

An example was the Kadoka Lake project on the Buffalo Gap National Grassland. This was a cooperative project with the City of Kadoka, South Dakota, Jackson County, Jackson County Conservation District, South Dakota Department of Game, Fish and Parks, and Ducks Unlimited, Inc. This project reconstructed a dam for a 230 acre lake. In addition, the City of Kadoka and Jackson County donated 160 acres of land to the Forest Service. Ducks Unlimited completed the construction phase of the project in September 1989 at a cost of $71,000 to Ducks Unlimited and $44,000 to the Forest Service. The impoundment will be the second largest wetland on Federal lands in western South Dakota. Waterfowl production is projected at 2,000 ducks and 280 geese. Benefits to upland species, such as pheas-

Forest Service biologist team up with the Colorado Division of Wildlife to trap and transport Big Horn sheep to new habitat areas on the Arapaho National Forest. Photo by Bud Smith

Wildlife Challenge Cost-Share Cooperators



Wildlife specialists from The Peregrine Fund, Inc., and the U.S. Forest Service check one of the peregrine falcons from the newly created hack sites constructed through a cooperative agreement. Photo by Pam Gardner

and potential habitat capability. WFHR approaches and methods are helping address important problems that pertain to conserving biological diversity, managing viable populations, and producing wildlife and fish to meet public demand. With the implementation of Forest Land and Resource Management Plans under way, the current emphasis of WFHR is to provide needed information and technology to support project planning, cumulative effects analysis, and monitoring.

The need for tools and methods to evaluate the cumulative effects of management is greater than ever and is being met in creative ways on individual national forests. The Bridger-Teton National Forest, for example, is developing a system to evaluate cumulative effects in the course of implementing the "vegetation management" emphasis of its new Forest Plan. The system links resource-response models (for wildlife and timber, for example) to a new landscape simulation model that "grows" the vegetation mosaic. Linking these components to a geographic information system (GIS) will produce an effective and state-of-the-art

ants and grouse, also will occur as upland habitat around the lake is improved. The project area also will provide habitat for the endangered trumpeter swan. In addition to helping meet the waterfowl goals of the North America Waterfowl Management Plan, the project will provide new educational and recreational opportunities for the people in surrounding communities.

Wildlife and Fisheries Habitat Relationships

During 1989, we made significant progress in applying the information, methods, and technology of the Wildlife and Fish Habitat Relationships (WFHR) system to enhance the consideration of wildlife and fisheries resources in national forest planning and management. An important focus of WFHR, the improvement of inventory methods and habitat evaluation procedures, makes it possible for more accurate assessments of existing

A log crib for fish is set in Gordon Lake. The project brought together six community groups dedicated to improving fish cover in the small, warm lakes on the Nicolet National Forest.
Photo by Bob Satran

system to implement the management direction in the Bridger-Teton Plan. Cooperators in the project include the Wildlife and Fish Ecology Unit of the Intermountain Region, State of Utah Automated Geographic Resources, and Utah State University.

The latest Wildlife Habitat Relationships (WHR) technology was given an in-depth review at HABITAT FUTURES 1989, a workshop convened at the Pack Experimental Forest in Washington State and hosted by the National WHR Program. The approximately 100 workshop participants included equal numbers of Americans and Canadians and of biologists and foresters. The workshop theme was "Integrating Timber and Wildlife in Forest Landscapes—A Matter of Scale," and the goal was to evaluate and improve current management approaches and technology for the integrated management of wildlife and timber resources. Through a memorandum of understanding, the British Columbia Ministry of Forests is publishing the proceedings.

Fisheries Habitat Relationships

During 1989, we made significant strides in the areas of basin survey methods and applications for habitat improvement planning, timber sale evaluation, and the use of GIS systems to display and evaluate information. In conjunction with this effort, Washington State University completed a stream habitat enhancement design model. This model will enable field biologists to evaluate hydrologic characteristics of streams to better design stream enhancement projects. Currently, these techniques are being used by the Forest Service, the Bureau of Land Management, and several state agencies.

Biological diversity is an important national issue confronting the Forest Service. Currently, we have established contracts with the Pacific Northwest and the Southeast Research Stations to study biological diversity issues in aquatic environments.

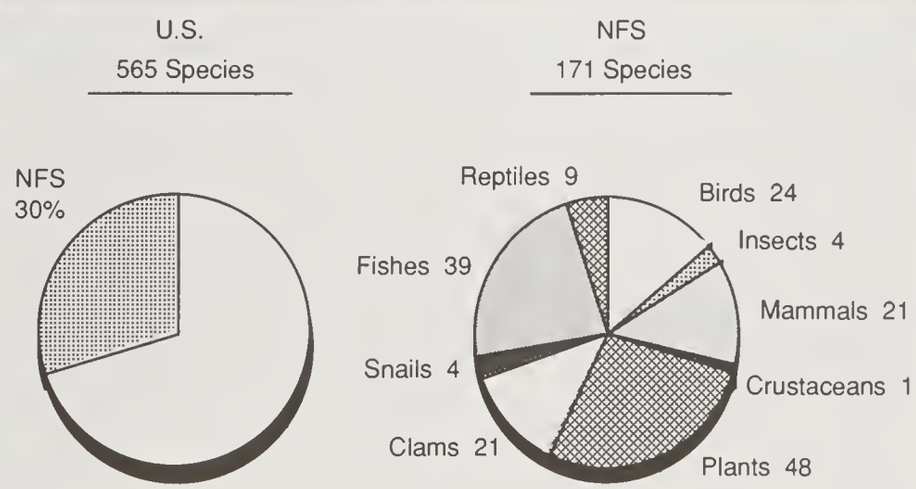
Threatened, Endangered, and Sensitive Species Management

Funding for habitat improvement of threatened, endangered, and sensitive species increased from $4.5 million in 1988 to $7.1 million in 1989. This increase provided for additional habitat improvement and recovery projects. We accomplished an additional $300,000 of habitat improvement and recovery tasks through the Challenge Cost-Share Program.

National forests and grasslands are home to 171 plant and animal species listed by the Fish and Wildlife Service as threatened or endangered. The Fish and Wildlife Service has approved recovery plans for 81 of these species. The forests use these plans to guide recovery activities. The Forest Service considers approximately 900 species to be sensitive and gives them special management considerations. Plants make up the majority of sensitive species.

The Forests and Regions have worked closely with State national heritage programs to conduct surveys and develop species management guides for sensitive species. These guides outline management actions needed to maintain population viability and prevent species from becoming federally listed. We are giving national emphasis to the bald eagle, peregrine falcon, grizzly bear, eastern timber wolf, Puerto Rican parrot, red-cockaded woodpecker, spotted owl, and the Mount Graham red squirrel. Species receiving Regional emphasis are the mountain caribou, Kirtland's warbler, Lahontan cutthroat trout, and Gila trout. The Gila trout, Gila topminnow, and Lahontan cutthroat trout are being considered for removal from endangered or threatened status as a result of the cooperative management enhancement programs. Western Regions involved with grizzly bear recovery are implementing a long-range management program titled "Charting the Course—The Forest Service Grizzly Bear Conservation Program."

Species Federally Listed as Endangered or Threatened



National Forests provide habitat for 30% of all federally listed species in the United States. These species include all varieties of life, from mammals to plants to clams.

Work to protect rare plants included completing recovery tasks for several threatened and endangered plants, as well as updates of Regional data bases on sensitive plant species. The Fish and Wildlife Service completed the delisting of a threatened plant, *Astragalus perianus*, an accomplishment in which the Intermountain Region had a major role.

RANGE

The Forest Service manages range vegetation, in both forested settings and on open rangelands, to maintain and improve forage production for domestic livestock, wild horses, burros, and wildlife. Range management also protects watersheds, wildlife habitat, recreational opportunities, habitat for threatened and endangered species of plants and animals, and open spaces. The type of range vegetation, its quality or condition, and relative abundance influence water quality and quantity, soil productivity and stability, and aesthetic quality.

Increased public interest about range condition, riparian areas, the spread of noxious weeds, and increasing competition between uses continue to challenge the Forest Service. In response, the Forest Service range management program is changing emphasis and addressing public desires for the future through a philosophy called Change on the Range.

In 1989, the Forest Service began testing new measurements to better describe range health, program outputs and benefits, and cost efficiency. We will incorporate new range management measures in future annual reports.

The range program was funded at $34.5 million (including the Range Betterment Fund) in 1989 and returned $10.9 million to the Treasury from grazing fees. Ten percent of the total receipts came from grazing on national grasslands and land-use projects in the Plains States and eastern National Forest System range. Grazing fees from these areas ranged from $0.62 to $3.38 per head month in 1989. Based on the existing Presidential formula, the grazing fee for the rest of the national forests in the 16 Western States was raised to $1.86 per head month on March 1, 1989. For grazing fee purposes, a head month is a month's use and occupancy of range by one weaned or adult cow, bull, steer, heifer, horse, burro, mule, five sheep, or five goats.

Nearly 104 million acres, 54 percent of all National Forest System lands located in 35 states, are divided into 9,752 range allotments that are managed for forage production. The acres in each allotment are further classified as suitable or unsuitable for livestock grazing, with about 48 percent of the 104 million acres classified as suitable.

Livestock Grazing

In 1989, the Forest Service administered 11,983 paid permits for 9.6 million animal unit months (AUM's) of grazing by domestic cattle, horses, sheep, and goats. An animal unit month is the amount of forage needed to support a mature 1,000 pound cow or its equivalent for 1 month. Permitted AUM's were about the same as 1988 and were slightly less than the 1988 RPA Recommended Program level of 9.8 million AUM's. Total permitted AUM's are expected to decline as Forest Plans are implemented.

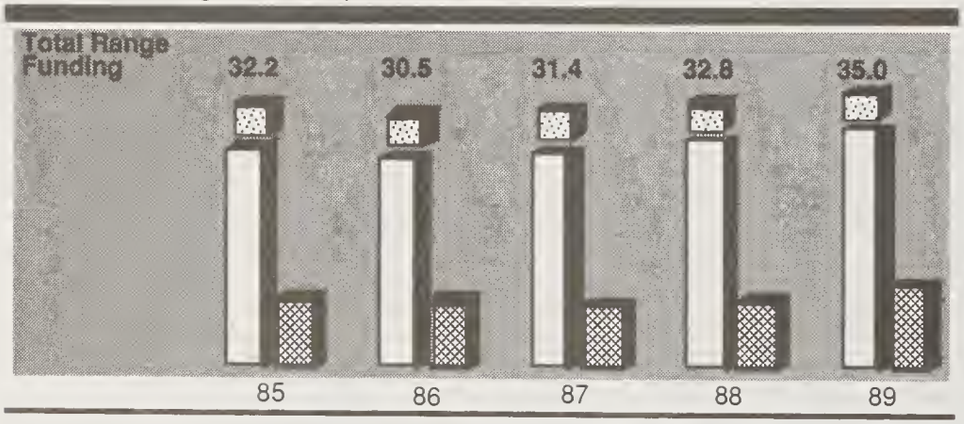
Range Condition

In managing range vegetation, the first priority is to maintain or improve its productivity and condition. Approximately 78 percent of the 50 million suitable acres in grazing allotments are in satisfactory condition. Satisfactory condition is achieved when the soil is adequately protected and forage species composition and production are at acceptable levels or on an acceptable trend.

Riparian Conditions

In 1989, for the first time, the Forest Service collected data concerning deteriorated riparian areas receiving treatment. Range program efforts resulted in 42,727 acres of riparian area treated to improve conditions.

Range - Funding and Receipts



(Million Dollars)

	85	86	87	88	89
Range Management Funding	28.2	26.9	27.6	29.2	30.6
Range Betterment Funding	4.0	3.6	3.8	3.6	3.9
Grazing Receipts	9.0	8.6	8.1	8.7	10.9
Receipts as Percent of Funding	28.0	28.2	25.8	26.5	31.1

Well-managed rangelands produce high quality watersheds, wildlife habitat, forage, and ecological diversity. Photo by Mark Johnson

Range strips are planted with two grasses: carpet grass and pensacola bahia. Both furnish extra nutrition for cattle on the Osceola National Forest. Photo by Barry Nehr

Noxious Weeds

According to current estimates, various species of noxious weeds infest 4.9 million acres of National Forest System lands in the Western States, and they continue to spread. Weeds create a management problem that affects many resource conditions or characteristics, such as wilderness, soil, aesthetic quality, and land productivity, as well as the forage supply and its nutritional value for wild and domestic animals. Controlling the spread of noxious weeds depends on coordinated efforts by all landowners in an infested area. In cooperation with local weed control districts, the Forest Service treated 23,861 acres of National Forest System lands in 1989, exceeding the target by 19 percent.

In 1989, the Forest Service sponsored a National Noxious Weed Workshop, attended by representatives from several State and Federal agencies. The Forest Service was assigned the leadership role for the Department of Agriculture concerning noxious weed management.

Range Improvements

Range improvements are designed to enhance or assure the maintenance of range condition, wildlife habitat, and soil and water quality; they protect watersheds and fragile areas while providing for sustained use. In consultation with range users and other resource interests, the Forest Service identifies needed forage and structural improvements that will protect vegetation and other range resources and lead to better distribution of grazing and foraging animals. Approximately 3,360 structural improvements, such as fences, water developments, and pipelines, were constructed with appropriated funds, exceeding the funded target by 58 percent. We completed range forage improvement work, such as prescribed burning, seeding, and mechanical treatments, on 115,166 acres, exceeding the funded target by 41 percent. Of the total structures and total acres of forage improvements completed, 407 and 23,399, respectively, were accomplished with Knutson-Vandenberg Act funds.

In addition to improvements accomplished with appropriated funds, the Forest Service accomplished 249 high-priority structural improvements and 1,354 acres of forage improvement with labor, funds, and materials donated by cooperating permittees, other agencies, and volunteers.

Wild, Free-Roaming Horses and Burros

The Forest Service estimates that 1,225 wild horses and 350 wild burros are the appropriate management levels for the 45 wild horse and burro territories on National Forest System lands. In 1989, 93 excess wild horses and burros were captured and made available for adoption.

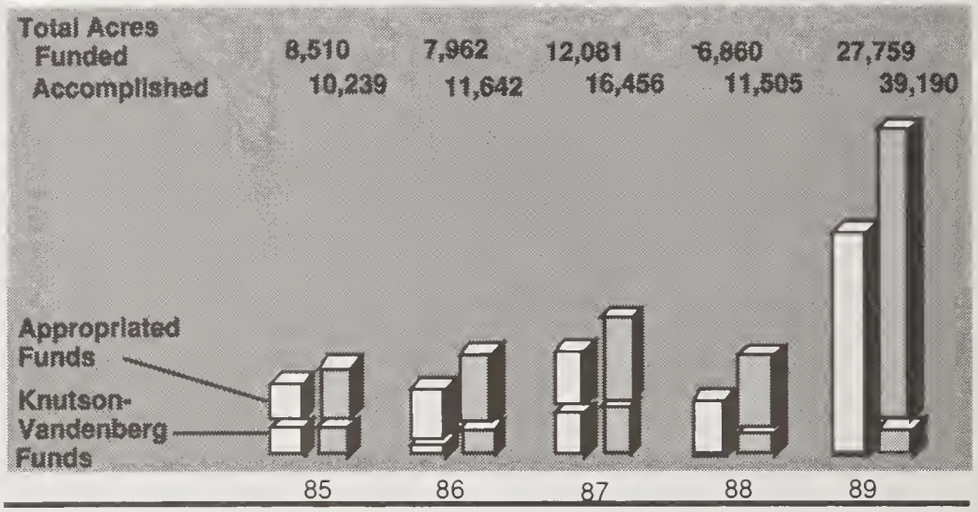
SOIL, WATER, AIR, AND WEATHER

The soil, water, and air management programs provide for favorable conditions of water flow for water of suitable quality and quantity to meet public needs and resource requirements. They also ensure the continued production of natural resources by protecting and enhancing soil productivity, minimize impacts from land management activities designing and implementing the best management practices possible, protect National Forest System land and adjacent airsheds from adverse effects of air pollution, and provide weather information for resource management and protection activities.

Soil and Water Resource Improvement

During 1989, the Forest Service improved the soil and water conditions on a total of 39,190 acres. We used appropriated funds to improve watershed conditions on 15,057 acres and 20,775 acres with excess timber receipts. Knutson-Vandenberg Act funds from timber harvest receipts provided improvements on 3,358 acres in 1989. We made many cost-effective improvements on timber sale areas to correct and improve watershed conditions. For example, we rehabilitated slopes damaged by gully erosion, established vegetative cover on bare soil, and obliterated old abandoned roads. These improvements increase the infiltration of water into the soil and reduce the overland flow of water that can remove soil and reduce productivity.

Watershed Improvements, Acres



	85	86	87	88	89
Funded					
Appropriated[1]	4,612	6,349	6,738	6,860	27,759
K-V	3,898	1,613	5,343	0	0
Accomplished					
Appropriated	6,381	8,080	10,413	8,683	35,832
K-V	3,858	3,562	6,043	2,822	3,358

[1] Includes excess timber receipt acres.

The Surface Mining Control and Reclamation Act and other State funding sources helped restore 245 acres of abandoned mined lands. Human resource programs and volunteers improved watershed conditions on another 297 acres of mined areas. Watershed conditions were improved coincident with various range, wildlife, and fish habitat improvements, such as fencing to control livestock, the establishment of fish pools, and reseeding.

Soil and Water Inventories

In 1989, the Forest Service completed soil inventories on 6.2 million acres, compared with 4.8 million acres in 1988. Soil inventories provide information on soil suitability and productivity, erosion, and stability problems, plus the baseline information needed to monitor changes caused by management actions. The Forest Service conducts most soil inventories as part of the National Cooperative Soil Survey. This information is vital for determining what activities can take place on the land and what special management requirements may be necessary to avoid damage to soil and water resources. These inventories also provide land type information that, when combined with vegetation information, form the basis for land use capability determinations for land management planning.

Riparian and Wetland Management

Riparian areas comprise approximately 1 percent of the land base in the Western States and wetlands comprise about 5 percent of the National Forest System. More than half of the wetland acreage is in Alaska. Forested wetlands are receiving increased attention to provide wise management and protection. Wetlands are key to productive fisheries and wildlife habitat, diversity of scenery and recreation sites, flood reduction, quality water for downstream users, continued recharge of groundwater, and sustainable forage production for livestock, wildlife, and wild horses and burros. These beneficial uses depend on healthy riparian conditions—

Foresters on the George Washington National Forest check selected square footage for natural growth of vegetation. By counting the blades of grass and analyzing other materials, foresters can better determine how to prevent soil erosion following timber harvesting.
Photo by Yuen-Gi Yee

conditions that also provide a good indication of the overall health of the land and its resources.

The Forest Service is continuing efforts to assess and improve riparian areas. Forest Plans contain guidelines and standards to maintain and improve these productive areas. Regions are developing Forest Plan implementation approaches that stress riparian values.

Emergency Watershed Rehabilitation

The Forest Service applied emergency rehabilitation measures to 1,720 acres of flood-damaged watersheds under the authority of the Agriculture Credit Act of 1978. We undertook these emergency rehabilitation measures to protect lives and property downstream and to reduce further damage to resources. Plans for rehabilitating fire-damaged resources are discussed in the Fire and Aviation Management section in the State and Private Forestry chapter of this report.

Water Quality

Field work is proceeding in most western Regions to quantify the amount of water necessary as instream flow to maintain stream channel stability. A balance must be maintained between the amount of sediments to be moved and the amount of energy available in the form of streamflow. Too much or too little water and increases or decreases in sediment loads will result in undesirable changes in stream channels.

We review proposed projects for import or diversion of water to ensure that timing and quantity of flows that will minimize increases in sediment loads are maintained by incorporating a nonpoint source management strategy into project plans.

Soil Quality Monitoring

Many national forests are monitoring the effects of management practices on soil productivity. For example, the Malheur National Forest conducted soil quality monitoring to determine the effects of timber management activities on soil compaction. Monitoring results showed that on many acres, the Regional soil protection standard for compaction was being exceeded. Research has demonstrated that excessive compaction can adversely affect soil productivity. Land managers have taken steps to mitigate the excessive compaction and prevent additional compaction from occurring.

Air Resources

A significant step forward in protecting the 88 Forest Service Class I wilderness areas from air pollution was the Agency-wide reexamination of air-quality-related values. Previously, air-quality-related values were generalized, loosely defined, and consequently difficult to manage. With the more precise and descriptive air-quality-related value definitions, forests are now more easily able to target monitoring programs and assess existing and potential threats from air pollution to each Class I wilderness area.

The Agency-wide field monitoring of air-quality-related values has burgeoned in the last few years, with more rapid growth projected through the 1990's. To efficiently manage these data so that they are readily accessible to technical staff, decisionmakers, and researchers, we are developing national air resource data base management, projected for completion in 1991.

Weather Program

The Forest Service issued a request for proposals for an Administrative Forest Fire Information Retrieval and Management System replacement that will meet Forest Service multifunctional weather needs as a weather information management system. We will award the contract for developing and testing the weather information management system in early 1990. The system should provide timely access to many sources of weather data and information, provide efficient tools for data management, and process and display through a supportive interactive user's environment with access to modern data management and data communication facilities.

To help the Forest Service resource managers make more effective and efficient weather-related decisions, we started a pilot project with the Western Regional Climate Center. The center will

develop climatological summaries and products from the remote automatic weather station data. The center also will work with a selected national forest staff to identify weather-related decisions to ensure that appropriate products will be developed for weather and climate applications.

The weather program coordinated an interagency workshop that focused on weather and climate data collection, quality control and maintenance, data archival and retrieval, and the applications of climate and weather information to assist resource managers.

Resource Coordination

The Forest Service accomplishes most soil, water, and air objectives by incorporating them into integrated management programs and projects. This is done by designing conservation practices that avoid resource damage, maintain long-term soil productivity, control nonpoint sources of pollution, and maintain riparian values and air quality. We spent approximately 35 percent of soil, water, and air funds on such resource coordination.

Federal Facilities Compliance

The Federal Facilities Compliance Program is designed to bring Federal facilities into compliance with various laws enacted to protect public safety and the environment. The two principle sources of funding for this program are the Department of Agriculture's Hazardous Waste Management Program and the National Forest Funds for Soil, Water, and Air. This program tracks and reports pollution abatement projects to the Environmental Protection Agency and to other Federal and State agencies. In 1989, 192 projects were accomplished with $3,223.3 thousand in appropriated funds, 9 projects were accomplished with $281 thousand in excess timber receipts, and 2 projects were accomplished with $101.7 thousand in other funds.

The hazardous waste program consists of cleaning up mining wastes from abandoned mining activities, disposing excess hazardous materials that are now classified as unusable and thus wastes, cleaning up old waste sites related to past Forest Service activities, disposing drug production wastes found on National Forest System lands, and finding a remedy for hazardous waste spills of unknown identity and origin. Two of the more critical laws are the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which covers the remediation of old hazardous waste sites, and the Resource Conservation and Recovery Act (RCRA), which addresses the new hazardous waste sites, hazardous materials, and waste minimization. We have cooperative agreements with States, the Environmental Protection Agency, and responsible parties for the cleanup of hazardous mining wastes, drug operation wastes, and miscellaneous hazardous waste dumps on National Forest System lands. The Forest Service also works with law enforcement personnel to track, apprehend, and fine individuals who illegally dump hazardous wastes onto National Forest System lands.

The Forest Service is actively engaged in identifying and correcting various other pollution problems related to sewage treatment, potable water, pesticides, land erosion, radon, asbestos, poor water quality, and air contaminants.

FACILITIES

More than 21 million square feet of space in approximately 16,000 owned or leased buildings and related facilities are required to support the diverse mission of the Forest Service. Lookouts, office buildings, warehouses, water and wastewater systems, crew and employee housing, research laboratories and greenhouses, visitor centers, fire stations, ground and aircraft fueling and maintenance facilities, and so on are located on 852 administrative units in 46 States and Puerto Rico. The Government owns approximately 85 percent of the facilities and leases the balance through the General Services Administration or private parties.

Facilities construction and replacement programs have not kept pace with the needs of the Agency. The Fire, Administrative, and Other Construction appro-

The Spotted Bear Ranger District on the Flathead National Forest was designed and constructed to match other historic buildings on the site. Photo by Dave Dodson

priation for 1989 was $8.3 million. Some obsolete facilities were replaced; however there are other facility construction needs that remain. We will identify the specific backlog needs in 1990. Maintenance programs continue to become more cost-effective through a structured approach to maintenance management. Maintenance appropriations in 1989 were $17.6 million.

To extend appropriated dollars, the Forest Service works with other agencies to build shared facilities that reduce construction costs and subsequent operation and maintenance expenditures. Where available and appropriate, we use Job Corps Center personnel, prison crews, and volunteers to construct facilities.

We use savings from other programs to support facilities construction within the $100 thousand congressional threshold for individual projects. By using these limited resource project funds to repair facilities, we are able to continue to provide for the health and safety of our employees and the public and to meet legal requirements, such as providing adequate fire access, access for the physically disadvantaged, and equal numbers of restroom and housing facilities for women and men.

Access for the physically disadvantaged was a high priority this year. We have been providing building access with these considerations in mind for several years, using the Uniform Federal Accessibility Standards for guidance. With the development of self-assessment training and guidelines, the Forest Service will begin to document needed improvements and work more aggressively to eliminate access barriers from all our facilities.

Initial screenings for radon concentrations have been completed in all of our occupied buildings, and mitigation measures have been completed in a few buildings. Long-term verification testing of these actions and positive screening tests are currently under way. We should complete most of the testing and mitigation of radon concentrations by the end of 1990.

Surveys and documentation of materials containing asbestos are under way in many units. While some friable asbestos has either been removed or encapsulated, the surveys also document all stabilized asbestos. National emphasis has been given to abatement and management of asbestos and radon from Forest Service facilities.

EQUIPMENT MANAGEMENT

The Forest Service owns and operates over 16,000 vehicles and approximately 2,000 pieces of specialized equipment to support forest programs Service-wide. Specialized equipment is required for various fire control and fire suppression activities, seed collection and nursery operations, road maintenance, timber and watershed activities, trail and campground maintenance, and wildlife habitat improvement projects.

The Working Capital Fund established by the Department of Agriculture Organic Act of August 3, 1956, as amended by the Act of October 23, 1962 (16 U.S.C. 579b), funds Forest Service equipment. This is a self-sustaining revolving fund that provides services to the National Forest System, experiment stations, and other agencies and, as provided by law, to State and private agencies and persons who cooperate with the Forest Service in fire control and other authorized programs. The Working Capital Fund owns, operates, maintains, replaces, and repairs all motor-driven and other equipment. Administrative units rent the equipment at rates that recover the cost of operation, repair, maintenance, management, and depreciation. The rental rates also include an increment that provides additional cash that, when added to depreciation earnings and the residual value of equipment, provides sufficient funds to replace the equipment.

The Forest Service has been working very closely with the Department of Agriculture in responding to the requirements of Title XV, Subtitle C—Federal Motor Vehicle Expenditure Control, P.L. 99-272, Consolidated Omnibus Budget Reconciliation Act. Most of the requirements of this law have been met by the Department. However, the most important, and the one requiring the most time and effort, is the requirement that each agency of the Federal Government conduct a cost study to determine the most cost-effective means of operating a fleet of vehicles "through ownership, reliance upon GSA's Interagency Fleet Management System, entering into a contract with a private vendor, or any other means (combination thereof) less costly to the Government."

The Department currently operates approximately 41,000 vehicles and units of specialized equipment through a combined use of Agency ownership, General Services Administration leases, and commercial leases. This equipment is distributed throughout the United States and to Canada, Mexico, Puerto Rico, Guam, the Virgin Islands, and at many foreign embassies throughout the world, resulting in USDA equipment being stationed at over 9,000 locations.

ROADS

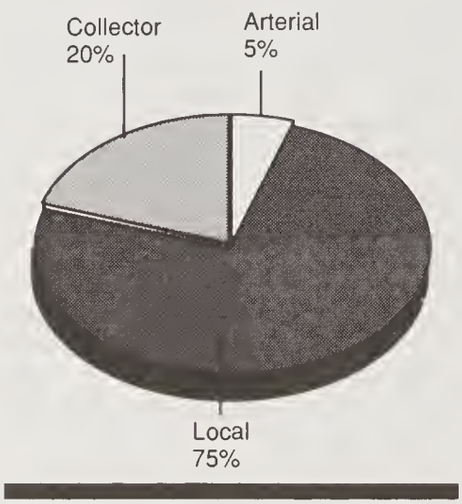
The Forest Development Road System provides principal access to National Forest System lands as required by resource management activities included in the Forest Land and Resource Management Plans. At the end of 1989, the Forest Development Road System was 360,000 miles. The increase from 355,700 miles in 1988 includes recent construction of new roads plus existing roads not previously included in the updated inventory. We manage this system to provide safe, cost-effective travel and to provide access to oversee and protect the national forest resources.

Roads provide access for many recreational activities, such as hiking, hunting, boating, fishing, skiing, and pleasure drives. Total recreation use represented over 242 million visitor days, which is 39 percent of all recreation use on Federal lands. Roads also provide access for fire suppression, removal of energy resources (such as oil, gas, coal, and firewood), mineral extraction, timber harvest and stand management, livestock grazing, reforestation, and wildlife and fishery

habitat improvement work. For example, each year the Forest Service uses these roads to facilitate wildfire suppression on an average of 1.2 million acres and for the reforestation of burned areas, for managing 10 million AUM's of grazing, and for sale preparation and harvest of 12 billion board feet.

Each road in the system is constructed, maintained, and operated according to its functional classification: arterial, collector, or local. Arterial roads provide access to large areas of land and many resources. They usually connect with other arterial roads or public highways. Collector roads are intermediate links that provide access to major land masses within a forest and link the local roads to the arterials. Local roads provide access for low-volume traffic from the collector roads to specific land and resource sites.

Road Function - Percent of Total System



Construction and Reconstruction

Because roads permanently modify landscapes and the environment, decisions to construct roads are made with great care. Where forest roads are frequently built on steep, rugged terrain where water quality standards are high and should remain so, we employ geologists, hydrologists, engineers, soil scientists, landscape architects, biologists, and professionals from a variety of other backgrounds to maintain these water quality standards. These professionals ensure that roads needed to manage national forests are planned and constructed in an environmentally sound fashion. For example, Forest Service scientists have studied the effects of road building and timber harvest on elk habitat for 15 years in Montana. Their findings demonstrated that with careful timber sale and road location, planning, and management, timber sales and associated roads will not adversely affect elk.

Researchers are developing new and better methods to reduce erosion from roads and to recognize and avoid unstable ground that has a high potential for landslide. We have developed and implemented several new techniques, such as less expensive retaining walls and slope stabilization methods. These technologies have reduced costs and helped ensure against adverse environmental consequences.

During 1989, the Forest Service constructed 1,823.3 miles of road and reconstructed 3,721.1 miles of existing roads. Additional work accomplished under the Tongass Timber Supply Fund include 2.9 miles of road construction, 4.4 miles of reconstruction, and 5 bridges at a cost of $11 million.

Forest road funds come from three sources. The Purchaser Credit Program provides for timber purchasers to build roads and receive credit equal to the costs of road construction as an offset against the price of the timber they purchase. The Purchaser Election Program allows small purchasers to have the Forest Service build roads funded from timber payments. The Forest Road Program provides for road building and engineering and support activities with appropriated funds. During 1989, we constructed 1,649.9 miles and reconstructed 3,028.7 miles using the Purchaser Credit Program or the Purchaser Election Program funds. The Forest Road Program provided for the construction of 173.4 miles and the reconstruction of 692.4 miles.

Most arterial roads are in place. The same is generally true for collector roads, except for a few forests with large unroaded areas where some new construction is required to implement Forest Plans. Thus, most new construction miles in 1989 consisted of short, low-standard local roads, 12 to 14 feet wide, with either dirt or gravel surfacing. These roads are spur roads off existing collector or arterial roads, built primarily for timber management access. These roads typically are also used for managing and enjoying other resources.

Most reconstruction work was performed on existing arterial and collector roads primarily for public safety and environmental improvements (for example, surface replacement and drainage improvement).

There is a misunderstanding about the number of miles of road constructed by the Forest Service for resource needs. Many think that we have constructed as many as 3,725 miles more than needed over the last 6-year period. The confusion arises from comparing planned road construction in the President's budget request to final accomplishment. For a correct comparison, it is necessary to compare miles planned based on actual appropriated resource output levels versus actual accomplishment. As timber sale and other output levels change, so do the miles of road construction and reconstruction, since the two are interdependent.

During the 6-year period, the Forest Road Program constructed 13 miles fewer than planned, and reconstructed 1,603 miles more than planned. Reconstruction occurs on existing roads, which does not add to the system miles. The increased reconstruction is required by the restriction of access to planned timber sales in roadless areas. Substitute timber volume from existing roaded areas of the National Forests requires additional road reconstruction to accommodate the increased timber haul. This skews the Forest Road Program by deferring construction of new high-cost access roads into roadless areas and adding low-cost reconstruction projects on existing roads to make them suitable for additional timber haul. For example, many miles of reconstruction

The majority of our transportation system consists of local roads--75 percent. They are normally single-lane, with dirt or gravel surfaces designed for slow speed traffic and provide limited vehicle access.
Photo by Sam Frear

Collector roads are normally single-lane, gravel-surfaced roads that provide all-weather access. They make up only 20 percent of the total system and provide a moderate level of comfort and convenience to the traveler. Photo by Rebecca Nisley

Arterial roads make up a very small part of the Forest Road Development system, approximately 5 percent. They are generally double-lane paved roads that provide for convenient, comfortable, and fast travel. F.S. Photo

merely involve replacing culverts or adding gravel to existing road surfaces. It is not correct to combine new construction with reconstruction and conclude that the Forest Service is building more roads than needed to support resource management activities.

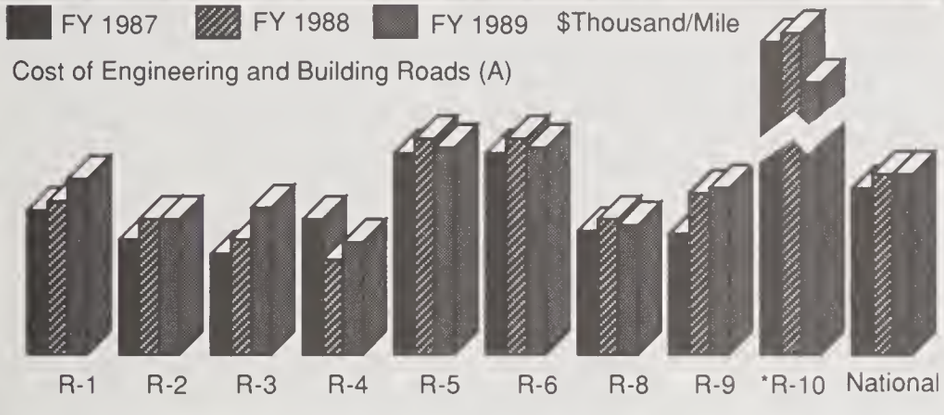
Emphasis on managing and controlling road costs is a continuing process. In 1981, we started a series of cost-control actions. A major objective was to ensure the efficient use of Forest Road Program, Purchaser Credit Program, and Purchaser Election Program funds. The Forest Service has made significant improvements in the unit costs of construction, reconstruction, and engineering support. For example, the Roads Analysis and Display System (ROADS), the most recent cost-control tool, makes it possible to identify areas where additional efficiency can be obtained. Data from this system are used at all managerial levels to monitor detailed cost-efficiency performance. During field visits, cost-control actions were monitored to ensure continued progress in reducing and avoiding excessive unit costs for this program.

Operations and Maintenance

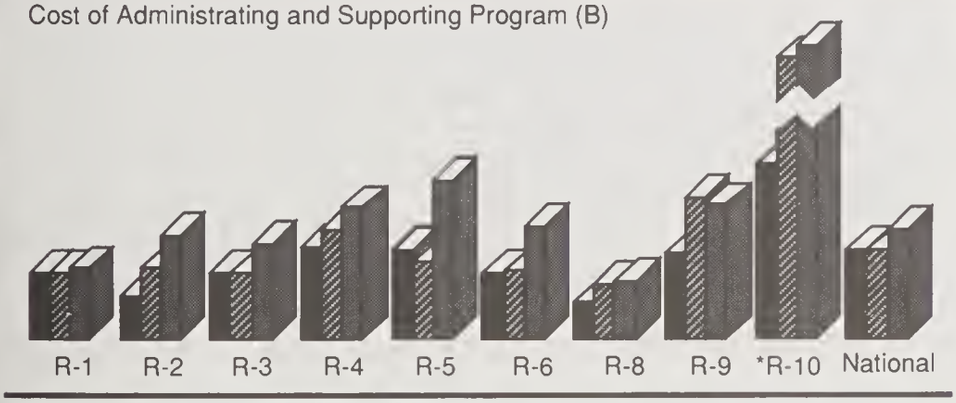
Over 95 percent of national forest activities depend on the Forest Development Road System. During 1989, the Forest Service expended $75 million in Federal appropriations to accomplish road and bridge maintenance. This work facilitated access for noncommercial forest uses by the public (mainly recreation) and for Forest Service administrative use. Commercial users of forest development roads, such as timber purchasers, miners, and private timber companies, are responsible for road maintenance work commensurate with their commercial activities. The commercial users fulfill their road maintenance responsibilities by actually performing road maintenance work or by depositing money with the Forest Service to fund the work. An estimate of the overall program distribution in 1989 follows:

- Road and bridge maintenance with

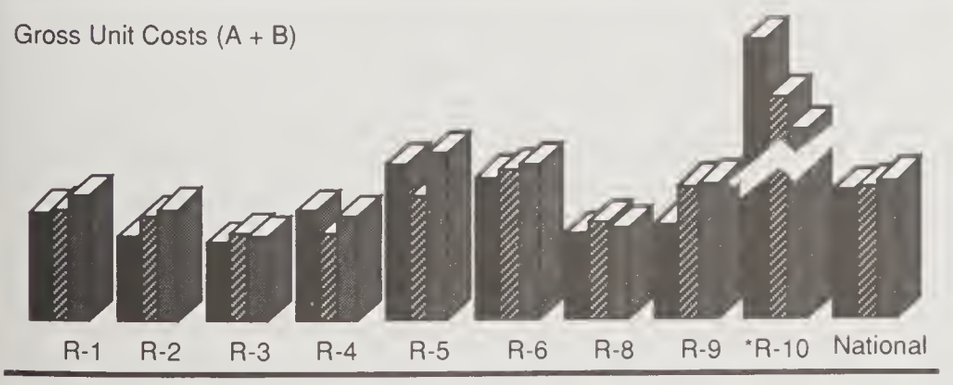
Summary of Unit Costs for Road Construction and Reconstruction



	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	*R-10	National
FY 1987	29.1	22.9	20.1	27.3	43.1	40.6	25.1	24.4	163.9	33.8
FY 1988	30.8	27.4	23.4	19.1	34.7	43.6	27.3	32.5	165.3	36.4
FY 1989	35.2	27.3	19.9	22.4	41.3	42.0	25.8	33.7	135.1	36.5



	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	*R-10	National
FY 1987	5.5	3.7	5.5	8	7.7	5.6	3.1	7.1	66.5	7.6
FY 1988	5.6	6.1	5.6	9.2	6.5	5.9	4.6	12.1	25.3	7.4
FY 1989	6.1	8.8	8.1	11.2	13.6	9.5	4.8	11.4	25.4	9.2



	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	*R-10	National
FY 1987	34.6	26.6	25.6	35.3	50.8	46.2	28.2	31.5	230.4	41.4
FY 1988	36.3	33.5	29	28.3	41.2	49.5	31.9	44.5	190.5	43.8
FY 1989	41.3	36.1	28.0	33.6	54.9	51.5	30.6	45.1	160.5	45.7

*Includes Tongass Timber Supply Fund

appropriated funds—48 percent ($75 million).

- Requirements of federal timber purchasers—48 percent ($75 million).
- Requirements of other commercial users—4 percent ($6 million).

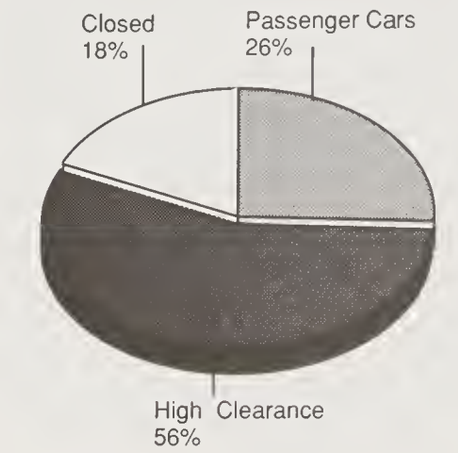
In accordance with the congressional reports accompanying the 1989 Appropriations Act, $9.5 million in maintenance funds were directed toward restoration work to avoid increased reconstruction costs in the Forest Road Program appropriation in future years. Restoration under maintenance included the replacement of signs, road surfacing, culverts, and other work necessary to restore a road to its initially constructed condition. Restoration work also may include the replacement of bridges and major culverts. Surface replacement accounted for a major portion of the restoration work.

Land-use planning has demonstrated that not all roads need to be constructed and maintained to provide access for all uses and types of vehicles throughout the year. During 1989, 56 percent of the road system was maintained for use by high-clearance vehicles (such as pickup trucks, four-wheel drive vehicles, and logging equipment) and 26 percent for use by low-clearance passenger cars. The remaining 18 percent was closed to motorized traffic yearlong.

The Forest Service often imposes seasonal restrictions on road use when necessary to protect wildlife during migration, mating, or rearing periods; to prevent fires; and to provide for public safety during periods of high fire danger. Road use restrictions also help protect road investments during inclement weather or when ground conditions are unstable. Restrictions can also provide for public safety by separating potentially incompatible uses, such as heavy logging traffic and recreation traffic.

Where planning has shown that perennial use of many roads is unnecessary, the percentage of intermittent-use roads is increasing. Intermittent-use roads are

Road Management
Percent of Total System



less costly to construct and maintain. In some Regions, such roads are seeded to grasses or native vegetation to serve as linear wildlife openings. During periods of nonuse by normal vehicles, roads are often available for other uses, such as snowmobiling, cross-country skiing, offroad vehicle driving, horseback riding, hiking, and hunting.

The estimated cost of the total road and bridge maintenance program, $156 million, is approximately 0.8 percent of the asset value of the Forest Development Road System, which is estimated to exceed $18.5 billion. With 1989 funding, approximately 49 percent of the Forest Development Road system was maintained to a standard adequate to protect investments and the environment and to support existing traffic demands. We maintained the remaining 51 percent of the road system at a reduced level and limited use to protect resource values.

TECHNOLOGY DEVELOPMENT

Through the Technology and Development Program, the Forest Service identifies promising new technology and applies it to land management. Numerous new ideas, methods, systems, and materials are brought into use in the Forest Service, other Federal and State Agencies, and on private land. Technology and Development activities are carried out through partnerships with Research and Development Units in the Forest Service, other Federal Agencies, and private corporations. Each year, new technology that improves efficiency, reduces costs, and makes significant contributions to the vitality and effectiveness of resource management is transferred to Government and private land managers .

The Technology and Development Centers at Missoula, Montana, and San Dimas, California, work on 70 to 100 projects in a given year. Following are new technologies that are being explored and tested this year.

Remote Sensing

The Forest Service, long dependent on and still a major user of aerial photography as a basic source of data, is now developing techniques and procedures for the effective use of digital remotely sensed data from satellites. We employ satellite data in many important areas of resource management; examples include: mapping effects of forest insects, change detection, forest inventory, fuels mapping, and wildlife habitat mapping. Principal data sources are the thematic mapper (TM) and the multispectral scanner (MSS) systems carried by the Landsat satellites. Initial testing of data from the French SPOT system and from the U.S. AVHRR system is in progress.

Satellite data alone can be analyzed usefully without supplemental data from other sources. However, combining digital data from satellite systems with digital data from other sources greatly enhances the usefulness of the satellite data and markedly improves the quality of the resulting analysis. Because the Forest Service has to manage large volumes of information in carrying out its mission, the association of remote sensing technology with developing Geographic Information Systems (GIS) capabilities is considered an important tool in managing various forest resources.

Specific examples of the development and operational applications of satellite data by the Forest Service include:

- Maps of wildlife habitat.
- Maps of old-growth forests in the Northwest.
- Change detection.
- Multiresource inventories.
- Maps of forest insect defoliation extent and effects.
- Maps of vegetation species, structure, density, and volume.
- Mapping and charting.
- Orthophotographs.

In 1990, the Forest Service will begin to review, document, and make recommendations on strategies for efficiently incorporating remote sensing technology into operational data collection activities.

Another developing satellite program that is increasingly supporting resource management requirements is the Global Positioning System (GPS) technology. The Forest Service has purchased approximately 55 GPS receivers and is in the process of evaluating the technology in a forest environment to determine Forest Service applications. The potential exists for applying GPS technology in many resource data collection activities, and GPS promises to provide an efficient, cost-effective method of collecting field data.

Timber Bridge Initiative

The National Forest System participated in the Timber Bridge Initiative by increasing the number of road bridges constructed of wood in 1989. We constructed 66 such bridges during the year, representing 55 percent of the total number (119) of bridges constructed by the National Forest System in 1989 and a 53-percent increase over the number (43) of wood bridges constructed in 1988.

Timber bridge research is continuing, with emphasis on improving hardwood use in timber bridges and developing new and better timber bridge systems.

Global Positioning Systems assist forest managers in making resource management decisions. Photo by Tony Jasumback

Parachute Maneuvering Simulator

The Missoula Technology and Development Center has developed a unique new training tool to improve smokejumper parachute maneuvering skills. The parachute maneuvering simulator is a realistic, computer-based training system. At the start of each simulated jump, the trainee views a full-color computer-generated scene showing a jump site, with trees, water, and other ground objects, from a jump altitude. The scene on the computer screen changes in response to parachute toggle movements as the trainee descends and maneuvers to the jump spot. This interactive scene motion provides realistic perceptions of turning, drifting, descending, and maneuvering. Instructors may vary start altitude, exit point, and winds to present students with varying jump conditions.

The simulator records and scores all jumps. There is a playback feature that lets the trainee and instructor review each jump. The playback shows the motion as viewed by the trainee and displays all toggle inputs during the jump.

Teaching parachute maneuvering to new smokejumpers using traditional chalkboard methods has always been marginally effective. With the parachute maneuvering simulator, smokejumpers at last have an effective way to improve their chute-handling skills. The expected payoff is a significant reduction in parachute landing injuries.

Computer Models for Aerial Pesticide Spraying

The effective application of pesticides over complex (mountainous, forested) terrain and under a range of weather conditions is complicated and dangerous. The Missoula Technology and Development Center, in cooperation with State and Private Forestry, the U.S. Army, and the National Aeronautics and Space Administration, has developed computer models to make spraying of pesticides over national forest land safer and more efficient. These models predict the amount of spray that deposits on targets and drifts offtarget as a function of multiple-related variables. Model scenarios can be run in the office to search for the optimum cost-benefit ratio with the least environmental impact.

The Forest Service is using these computer models to help develop spray plans for treating gypsy moth, western spruce budworm, Douglas-fir tussock moth, and seed and cone insects. The models have minimized the amount of offtarget drift, thereby increasing treatment effectiveness while reducing environmental impacts, costs, and the potential for litigation.

Expert Sign Advisory Program

Many experienced Forest Service personnel with technical sign expertise are approaching retirement. To retain their expertise, we decided to develop an Expert Sign Advisory System. This user-friendly computer system is a training tool for personnel with limited traffic engineering experience. It also can aid experienced traffic engineers and technicians in selecting, procuring, placing, and installing appropriate road traffic control devices.

The prototype system has been developed only for the standard road warning signs relating to changes in horizontal alignment. It consists of two components: (1) determination of the need for signs and (2) basic sign training. The first component uses a set of factors to determine the need for signs. After the selection of a sign, the system will allow the user to select an output option: display, print, file, or a combination. The output includes text and graphics. If the output is filed, the user may save it on a floppy disk. If it is printed, the hard copy can be signed by sign engineers as a final document of record. The second component includes general and specific information about

warning signs.

Field testing of the prototype program indicates that this system captures years of expert knowledge and passes it to new employees. Potentially, it can produce a 75-percent savings in office research and documentation time with the full development of the system.

MAPPING AND RELATED DIGITAL SPATIAL DATA ACTIVITIES

Traditionally, maps have been a cornerstone of the land and resource management activities of the Forest Service. As these activities have grown steadily more complex, mapping and related fields have grown by automating many aspects of the map-making process and by capitalizing on new technology, such as GIS. At the same time, increased coordination between agencies serves to avoid duplication of effort and increase the quality of data and information available to users.

Field personnel use Base Series maps, containing such information as transportation, hydrography, boundaries, and ownership, for inventory and display of resource and other thematic information. Production of these maps is the responsibility of the Geometronics Service Center (GSC). Over the past few years, GSC has begun digitizing the information on these maps for later revisions. Now, in support of the National GIS Plan, this process has been accelerated. The digital spatial data files being collected will thus serve the additional important purpose of acting as a base to which resource data can be registered in each forest's GIS. The data files also will be supplied to the U.S. Geological Survey (USGS) for inclusion in the National Digital Cartographic Data Base, where they will be available to a broad range of potential users.

A number of other efforts are under way that involve cooperation with other agencies. A recent interagency agreement with USGS and the Bureau of Land Management has the goal of coordinating digital data collection activities for basic categories, such as the Public Land Survey System. Another agreement with USGS, in place for several years, calls for a one-for-one exchange of Digital Elevation Models (DEM), with each agency giving the other 700 files per year. This has doubled the rate at which the Forest Service acquires full DEM coverage. There also is a cooperative effort with the Soil Conservation Service to develop a map digitizing and edit system.

LAW ENFORCEMENT

The objective of the Forest Service's law enforcement program is to protect natural resources, Federal property, employees, and visitors to the national forests. Approximately 150 special agents and 600 uniformed law enforcement officers perform enforcement and investigative activities unique to the National Forest System. Major activities in 1989 included controlling illicit drug production and trafficking on National Forest System lands, investigating the theft of timber and other natural resources, investigating wildland arson, and enforcing the Archaeological Resources Protection Act.

Since the enactment of the National Forest Drug Control Act of 1986, the Forest Service has apprehended nearly 1,000 suspects in illicit drug production activity in the National Forest System. We also destroyed approximately 1 million marijuana plants valued at nearly $7 billion. Our Agency's line management and law enforcement personnel are active participants in implementing the President's national drug control strategy.

Archaeological depredation cases have been investigated since the mid-1970's. Law enforcement personnel have been directly involved in many successful prosecutions under the Archaeological Resources Protection Act. The loss of cultural resources from vandalism, artifact excavation, illegal construction, and theft on National Forest System lands continues to be a significant concern.

Special efforts are made to cooperate with State and local law enforcement agencies and with other Federal agencies. The Forest Service has approximately 400 cooperative (mutual assistance) agreements with State and local agencies nationwide. These agreements allow the Forest Service to reimburse agencies for the cost of protecting the public and their property on national for-

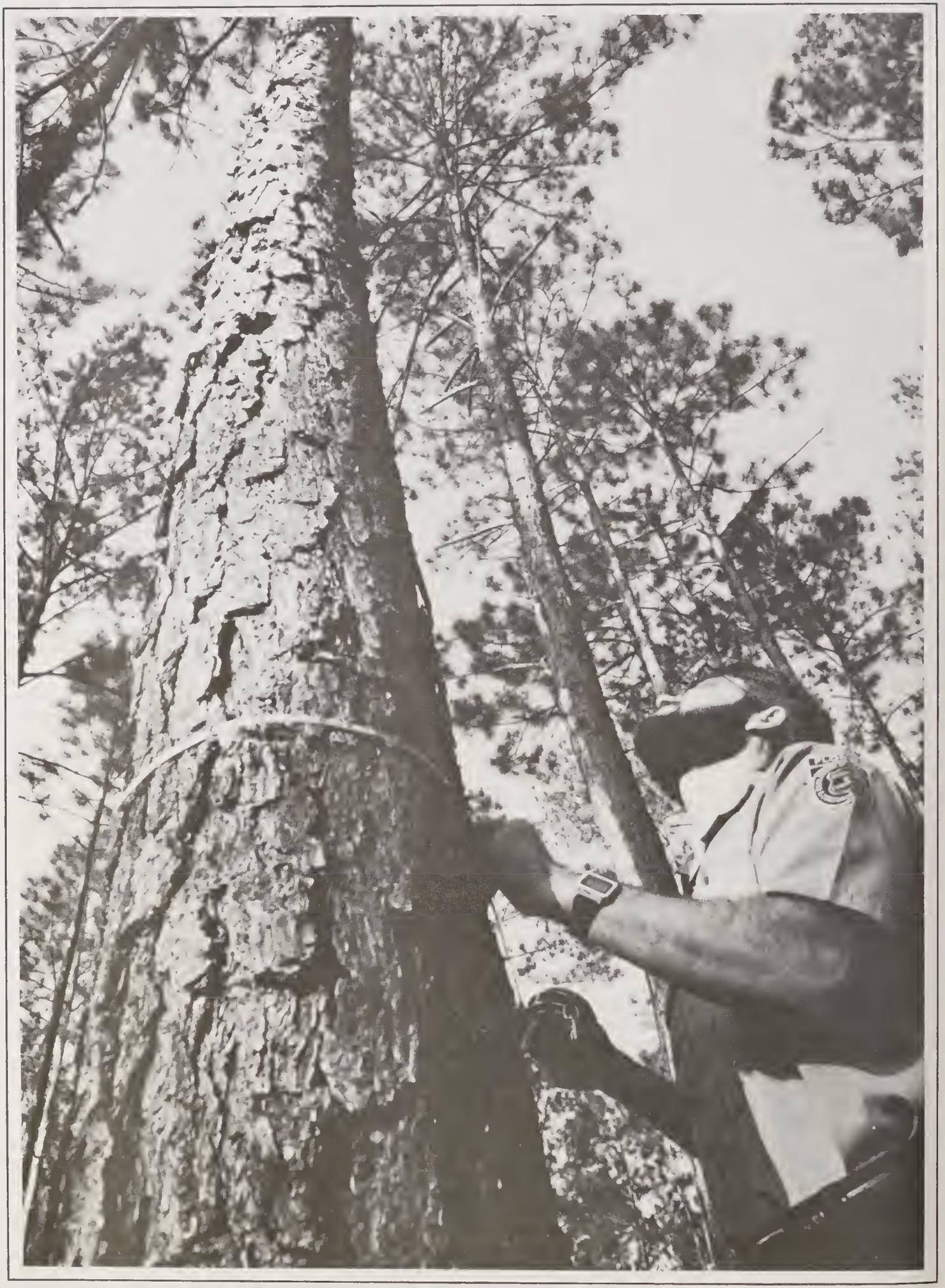
Members of the Forest Pest Management team work with aerial photography at Nationwide Forestry Applications Program facility in Salt Lake City, Utah. Photo by Henry Lachowski

ests. The agreements also provide for mutual support between Forest Service law enforcement personnel and other agencies so that even in remote areas, visitors to the National Forest System are able to have a higher level of protection and service.

During the past year, a Forest Service law enforcement officer was killed while working in cooperation with a county sheriff's department for the apprehension of criminals located in the vicinity of National Forest System lands.

All Forest Service law enforcement personnel attend rigorous academy training courses at the Federal Law Enforcement Training Center in Brunswick, Georgia, or at equivalent academies. These personnel attend advanced training courses to maintain the highest possible level of proficiency. Because of high training and performance standards, as well as the expertise demonstrated by these personnel, many Federal and non-Federal agencies view the Forest Service law enforcement program as effective and professional.

Forest employee, along with a local official, plans logistics on marijuana raid.
Photo by M.L. Cagle



F.S. Photo

State & Private Forestry

Building A Better America

Photo by Yuen-Gi Yee

INTRODUCTION

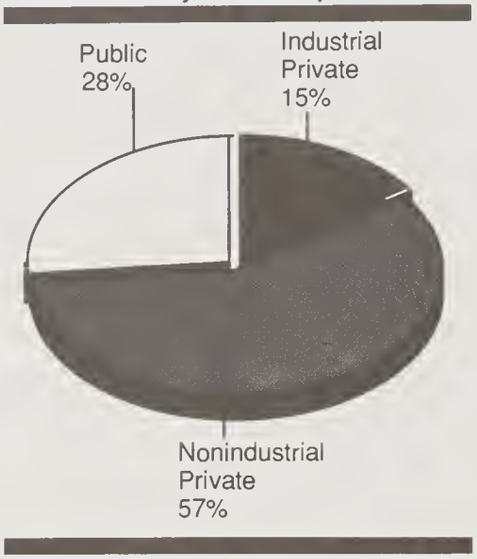
The State and Private Forestry (S&PF) program provides assistance for over 700 million acres of forestland outside the boundaries of the National Forests. State and Private Forestry serves as the link between many public and private organizations and bridges ownership and organizational boundaries to promote the wise use of our natural resources today and for the future. S&PF also provides protection from fires and forest pests on National Forest System lands and technical and financial assistance to help manage and protect private and other public lands.

The demand for forest products is projected to rise 49 percent between 1986 and 2040. Practically all of the timber production to meet this increased demand is expected to come from private forest lands. These lands constitute 72 percent of the Nation's timberlands—15 percent is owned by forest industry and 57 percent by private nonindustrial landowners. A major role of S&PF is to encourage and support private landowners in providing the forest resource management that increases and sustains their land productivity, enabling them to meet both timber demands and environmental objectives.

Under the Cooperative Forestry Assistance Act of 1978, S&PF programs provide technical and financial assistance to State forestry organizations, which in turn offer direct assistance to private forest landowners. This assistance includes nationwide studies and analyses on forest management and protection issues that affect all landownerships. Funding for the accomplishments on private lands reported in this chapter reflects the combined totals of Federal, State, and private dollars allocated for those accomplishments.

S&PF takes the lead in transferring knowledge and technology inside and outside the Forest Service to improve forest resource management, use, and protection. The Forest Service helps transfer and apply forestry research results throughout the forestry community. We also help find new technologies and information needed by individuals, academia, and Federal and non-Federal organizations. Technology transfer methods include symposiums, training, technical assistance, demonstration projects, formal technology transfer agreements, and the exchange of employees, publications, and consultations. International technology transfer efforts this year included the first International Wildland Fire Conference attended by people from 39 nations.

Timberlands by Ownership



S&PF also focused on three other areas of service: forest health, urban encroachment on wildlands, and rural economic development. Monitoring forest health is a vital element in enhancing the health of the Nation's forests. S&PF increased its emphasis on surveys and evaluations to help explain forest pest and condition trends and to provide information for resource management planning, resource management operations, and forest health reporting.

More people with urban perspectives and values for land use are living in adjacent wildland areas. Such urban encroachment affects all aspects of natural resource management and protection. In this growing wildland/urban interface, S&PF has been identifying problems and defining needs for new technology in fire protection, forest health, and forest management.

S&PF forest resource management efforts helped diversify rural economies and support efforts to revitalize rural development activities. We work through State forestry agencies and with others at State and local levels to promote natural resource management as a key part of each State's rural development planning.

FIRE AND AVIATION MANAGEMENT

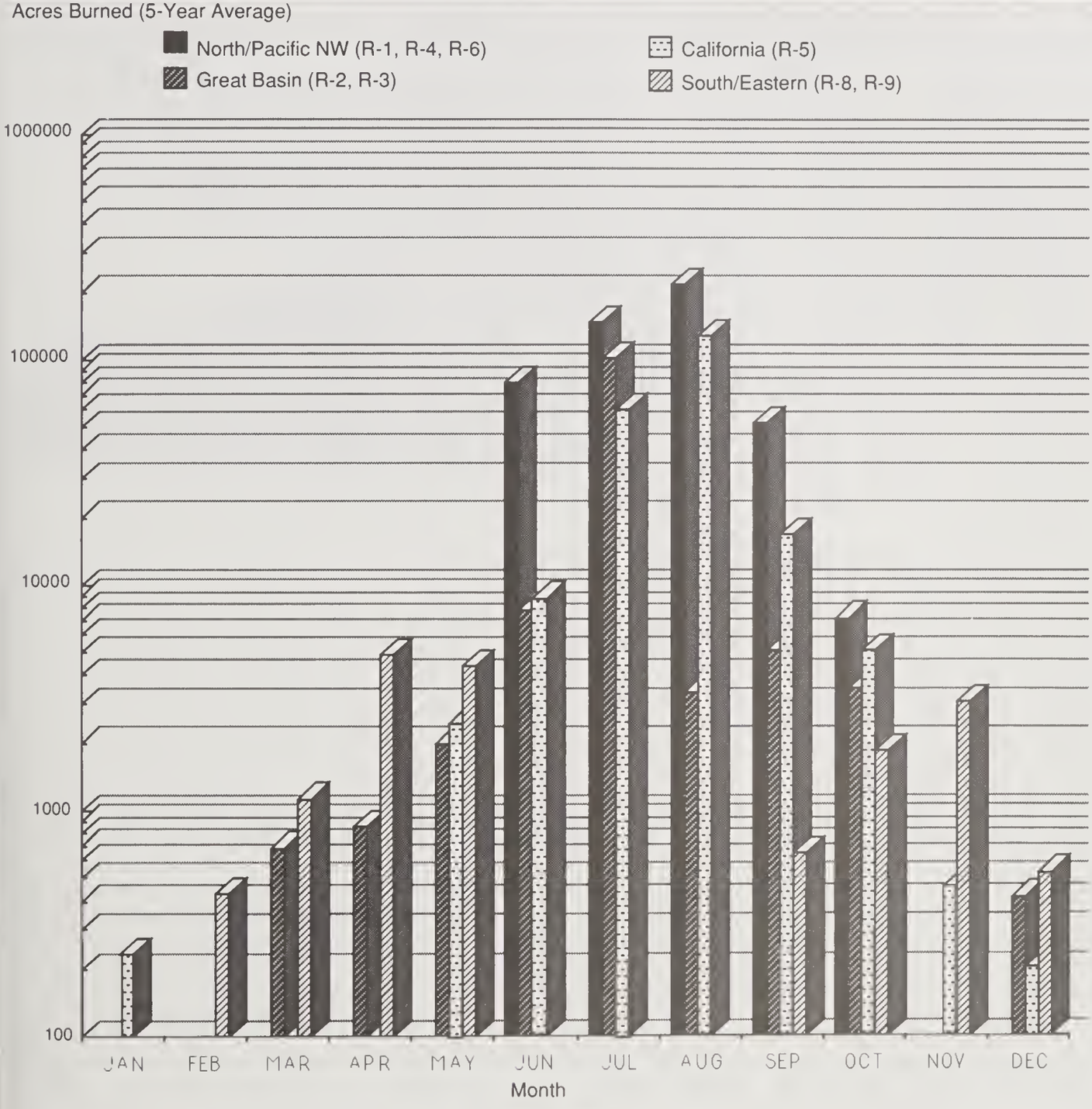
Fire and Aviation Management includes fire presuppression, fuels management, and fire suppression activities. The Agency's fire presuppression efforts include activities to train, equip, and position fire suppression forces while reducing fire occurrences through education. Fuels management activities alter the physical environment by reducing the impacts of hazardous forest and rangeland fuels. Fire suppression activities provide direct and immediate wildfire response by mobilizing, coordinating, and managing fire personnel and supplies from many government and private organizations.

No wildland fire agency by itself can afford to develop and maintain the level of capability required to deal effectively with all wildfires under all fire severity conditions. The Forest Service provides an effective and efficient fire protection organization to protect 191 million acres of National Forest System lands under normal circumstances. During periods of intense fire activity, the Forest Service relies on the mobility of firefighting resources and on planned assistance from cooperating Federal, State, and local agencies in emergency fire situations. The Forest Service is a lead agency in developing and supporting a strong network that integrates multiagency firefighting resources during fire emergencies and transports them across the Nation to supplement local resources.

The 1989 Fire Season

Long-term drought areas had the potential to create another major fire season comparable to those of the past few years. The Forest Service prepared for another severe fire season by improving the effi-

Seasonal and Geographical Distribution of Large Fires on NFS Protected Lands (1984-1988)



■	0	0	0	0	0	80,034	147,112	215,289	52,635	7,101	0	0
▨	0	0	686	846	2,008	7,807	103,084	3,348	5,157	3,512	0	418
⊡	232	0	0	0	2,455	8,909	60,086	127,529	16,752	5,157	457	202
▨	0	436	1,128	4,927	4,413	0	0	0	651	1,853	3,031	536

ciency of its fire organization. In 1987 and 1988, large fires continued to burn into November. In 1989, the major impact of the fire season was over by the end of August due to favorable weather conditions.

We increased preparedness and contingency planning efforts through allocation of emergency fire severity funds to those areas with extreme fire potential. Severity funds supplement actual, planned budgets for emergency fire planning, training, and wildland firefighting equipment. Inventories of tools and equipment were increased at all fire caches and the preparation and awarding of contracts for aircraft, fire retardant, caterers, shower units, and other suppression resources were accelerated. July fire statistics indicate the benefit of this extra effort. Although the number of fires increased 8 percent, there was a 75 percent decrease in burned acreage from 1988.

Controlled burning on the Angeles National Forest. Photo by Roy Murphy

Incident management teams met to review past fires and develop new opportunities to increase firefighting effectiveness. Firefighter training was conducted for new Forest Service employees and cooperators. The Agency trained an additional 3,600 people to serve as firefighters on a call-when-needed basis. A new fire business management accounting system was developed to track fire expenses, and cooperative agreements with many State and Federal agencies, including the military, were reviewed and updated.

Fire season rarely peaks at the same time in more than one geographic area of the Nation. The South and East are most susceptible to large fires in the spring and fall. The southwestern portion of the Great Basin tends to have an early summer fire season. The Pacific Northwest and California usually have large fires in late summer. These seasonal differences permit the shared-resource system to work effectively in mobilizing firefighting resources to respond to fire emergencies anywhere in the Nation.

In response to firefighting resource demands, the Sixth Army provided four battalions (2,000 firefighters plus support) and 19 helicopters to aid suppression efforts in Oregon and Idaho. A multiagency effort established two temporary centers in Oregon to train firefighters to supplement experienced local personnel. The U.S. Naval Reserve and Eastern Oregon State College also provided training facilities. Assisted by the Oregon State Employment Division, representatives from the Forest Service, National Park Service, Bureau of Land Management, Bureau of Indian Affairs, and the Washington State Department of Natural Resources identified and instructed firefighting personnel. After training, 660 new recruits were immediately dispatched to fires, relieving experienced personnel for more complex assignments.

Most fires in the West started as a result of intense lightning storms, and they remained small. Fire suppression effectiveness was enhanced by rapid mobilization of firefighting resources and favorable weather conditions.

Fire Management Policy Review

The severity of the 1988 fire season, particularly the fires in the Greater Yellowstone Area, refocused attention on fire management policy for wilderness areas and national parks. In response to public concern, the Secretary of Agriculture and the Secretary of the Interior reviewed current policy with participants from the Forest Service, National Park Service, Bureau of Land Management, Fish and Wildlife Service, Bureau of Indian Affairs, and the National Association of State Foresters. This review provided an opportunity to strengthen relationships among agencies while jointly improving communication with the public. The report from this review validated the existing fire management policy for prescribed natural fires in wilderness and included the following recommendations for improving the existing processes:

- Development of regional and national contingency plans to constrain prescribed natural fires under extreme burning conditions.
- Use of planned ignitions to complement natural fire programs and to remove hazardous fuels.
- Need for additional research in areas relating to weather, fire behavior, and fire history.
- Increased involvement with public,

State, and other agencies during planning.

Cooperative Fire Protection on State and Private Lands

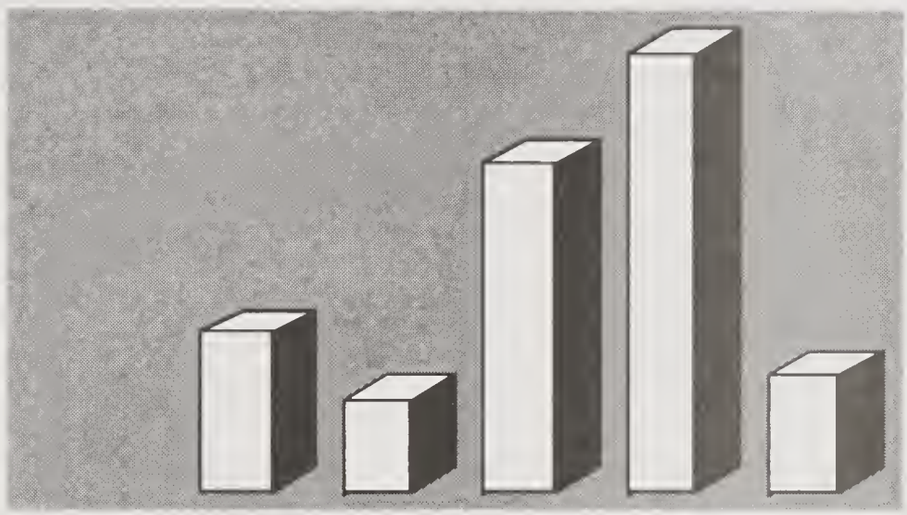
States are responsible for fire protection on their own State and private lands. In the absence of adequate protection, however, the Federal Government is often asked to assist. The programs under Cooperative Fire Protection improve the States' capabilities to manage their fire problems.

Cooperative Fire Protection operates through two main component programs: Rural Community Fire Protection and Rural Fire Prevention and Control. Both programs receive support from several other smaller programs that provide States with financial assistance for equipment, training, information gathering and dissemination, and technology transfer on a matching-cost basis. The Forest Service provides coordinated technical assistance to implement new technology and research. The primary goal is to improve the efficiency and effectiveness of wildland fire protection for the Nation as a whole.

Rural Community Fire Protection. The Rural Community Fire Protection Program helps strengthen volunteer fire departments in communities with a population of less than 10,000 people. Funded by the Farmers Home Administration and administered by the Forest Service through State Foresters, the program is used for organizing, training, and equipping rural fire departments. The program assists local fire departments with a basic level of protection for rural communities.

Rural Fire Prevention and Control. The Rural Fire Prevention and Control Program provides Federal assistance to States for accomplishing tasks agreed to in Regional Cooperative Fire Protection Plans. Although this program initially helped States to organize State fire protection programs, its current role has become one of improving the efficiency of State programs and encouraging more regional and national cooperation. Rural Fire Prevention and Control is the primary Forest Service program that promotes the sharing of firefighting resources and expertise among States and Federal agencies.

Acres Burned Under National Forest System Protection



	85	86	87	88	89
Thousand Acres	567	337	1,163	1,150	418*

*Preliminary figure.

One activity of Rural Fire Protection and Control is the Federal Excess Personal Property program which loans excess used Federal equipment, primarily military equipment, to State forestry agencies for fire protection. The Forest Service facilitated the loan of more than $34 million dollars worth of Federal equipment for fire protection purposes in 1989. For example, 13 Bell helicopters were transferred to State forestry agencies to upgrade the existing fleets used for wildland fire protection. Also, 50 all terrain vehicles—the Gamma-goat—were transferred to State agencies. The Gamma-goat will be modified for fire protection use and evaluated over the next few fire seasons.

Wildland Urban Fire Protection Initiative. Started in 1986, this initiative is a multiagency partnership among the Forest Service and other Federal agencies, the National Fire Protection Association, and National Association of State Foresters to reduce the potential wildfire hazards and risks associated with areas where forest lands and homes intermingle. As the number of people desiring to live in natural settings has increased, so has the fire threat. The program objectives are to educate the public about the issues, encourage State and local governments to implement fire preventive measures, and provide professional expertise for creating a more fire-safe environment.

HOTLINE

The success of the HOTLINE fire information center, which began in 1988, continued into 1989. The HOTLINE responded to the demands for timely and accurate wildfire information from national television networks, wire services, and several major newspapers. It also provided information to professional journals and other magazines, such as National Geographic, The New Yorker, and U.S. News and World Report.

Firefighters build a fire break. Photo by Yuen-Gi Yee

Smokey Bear Program

This public awareness program serves the needs of Federal, State, and local agencies engaged in wildland fire prevention. Its simple message—"Only You Can Prevent Forest Fires"—is often aimed at youth but reaches a broad audience. The fire prevention message now reaches a greater audience through "Smokey and the Pros," a partnership introduced several years ago. It combines the public visibility of professional athletes with the Forest Service Smokey Bear image. This partnership now includes 44 professional teams and a large number of professional athletes competing in individual sports. In 1989, the program expanded to include sports teams from colleges, the Rodeo Cowboys Association, and Little League baseball programs.

Forest Service partnerships with major corporations expanded the audience for fire prevention awareness messages through private sector advertising resources. These partnerships also add revenue that helps continue fire prevention efforts. For example, a partnership with Johnson & Johnson presents a fire prevention message while providing children an opportunity to acquire a Smokey Bear stuffed toy. Another partnership with Nelson/Weather-Rite displays a fire prevention message on camping products.

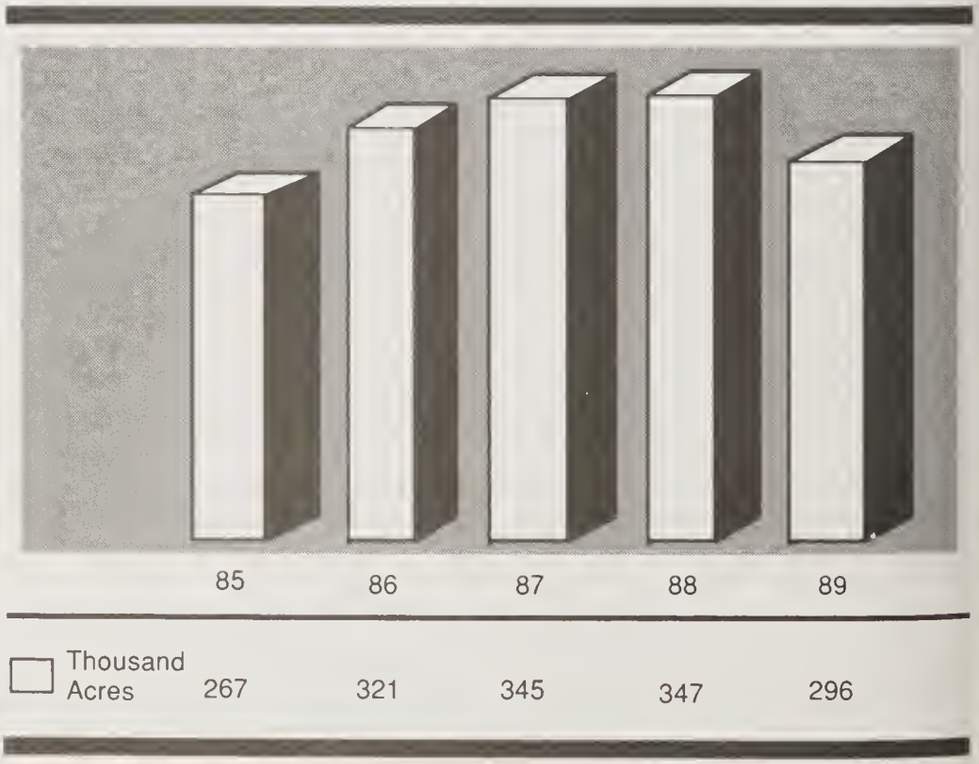
Disaster Assistance

The logistical and technical capabilities that assure effective fire suppression are also useful for other disaster situations. For example, the Forest Service Incident Command System, which provides teams of trained personnel in specific organizational roles, adapted readily to aid cleanup efforts in the Valdez oil spill in Alaska.

Incident management teams also assisted at an underground fire in a New York landfill suspected of containing hazardous waste and in Puerto Rico, South Carolina, and North Carolina after Hurricane Hugo. Communications equipment was sent to support emergency operations for a major train accident in the Soviet Union and to provide a backup system for the Nuclear Regulatory Commission in South Carolina. The Agency also loaned portable radio systems to law enforcement personnel involved in a multiagency marijuana eradication effort in California.

Fire and Aviation Management also maintains an effective working relationship with

Acres of Fuels Treatment Accomplished - National Forest System Lands



the Federal Emergency Management Agency, the Natural Hazard Center at the University of Colorado, and the National Academy of Sciences to provide a unified approach to fire and other natural disasters for the entire Nation.

Fuels Management

During 1989, the Forest Service performed treatment to reduce fuel hazards on more than 295,000 acres. Fuels accumulate on forest floors through management activities and through natural processes. An aggressive fuels management program can greatly reduce damage from wildfires by reducing a fire's intensity and the rate of fire spread.

Fuels treatment is essential to long-term fire protection of National Forest System lands and for adjoining State and private lands and property. Effective fuels management requires a sustained program over many years to achieve program benefits—fewer large fires, fires that are easier to control or manage, and fires that cause less environmental damage.

Aviation

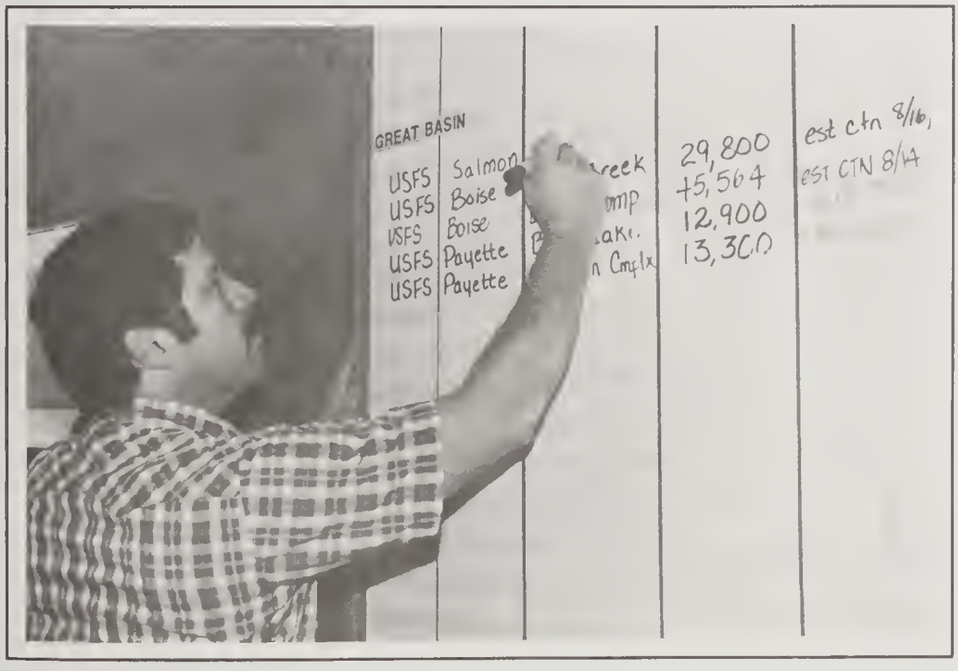
The Forest Service arranged to have retired Air Force Lockheed C-130A and Navy Lockheed P-3A aircraft available for use as airtankers to replace older airtankers such as the C-119's. During the 1989 fire season, the first modified C-130A airtanker was successfully used in California and Idaho. The first use indicated the new aircraft meets or exceeds all expected performance and operational projections and will significantly increase aerial-retardant application effectiveness in fire suppression.

The Forest Service used its first retired Air Force C-130A aircraft for retardant application during the 1989 fire season. Photo by Lindsey Smith

Boise Interagency Fire Center

The Boise Interagency Fire Center (BIFC) was established in 1965 to improve the coordination of fire support activities among Federal and State firefighting agencies.

BIFC staff include fire management personnel from the Forest Service, Bureau of Land Management, Bureau of Indian Affairs, National Park Service, Fish and Wildlife Service, and National Weather Service. One of the organizational units at BIFC is the National Interagency Fire Coordination Center which serves as the national interagency dispatch center from which dispatchers mobilize and direct personnel, equipment, and supplies to incidents. During the past 4 years, they have mobilized more than 110,000 firefighters and support personnel. In 1989 alone, they mobilized 5,817 military personnel, 2,800 State firefighters, and 32,000 Federal firefighters and support personnel and processed 11,395 individual requests for firefighting resources.



Personnel at BIFC keep records of fires. F.S. Photo

International Support Activities

In July, the Forest Service organized and hosted the first International Wildland Fire Conference in Boston addressing global cooperation—an issue of increasing importance with the current trend in world population growth. Thirty-nine nations were represented among the more than 400 participants. This conference was the first of its kind to bring together wildland fire managers and decisionmakers to discuss global wildland fire issues and look for new ways to confront them. As our global community becomes smaller and our interdependence grows, meetings such as this will prepare us to meet the challenges of wildland fire management.

In specific instances, countries have requested technical assistance in the areas of fire management planning and training. Forest Service personnel developed fire management strategies for Mexico, Israel, and Spain. The Agency also developed the training program for the 5th International Fire Suppression Training Course in Spain. Forest Service representatives assisted the Costa Rican Government by evaluating their current fire management program and developing a fire training course to meet specific local objectives.

To share recent technology, Australians participated in study tours in Denver that provided state-of-the-art information and developed operational relationships and international goodwill.

The Forest Service addressed international cooperation at a more local level through active membership in the North American Forestry Commission's Fire Study Group which is concerned with issues that involve and affect Canada, Mexico, and the United States.

Workforce Diversity

New ideas, innovative approaches to problems, divergent opinions, and individuality are products of workforce diversity. To address current changes in the Forest Service employee population, manage these changes to advantage, and highlight the needs of various elements within that population, Fire and Aviation Management Staff conducted the first nationally sponsored Workforce Diversity Conference. It was attended by more than 400 people. Many new ideas for furthering the goals of work force diversity were proposed and are being developed for implementation.

FOREST PEST MANAGEMENT

The direct benefits of timber values saved by pest management prevention and suppression project activities on all lands are estimated at $74 million for 1989. Pest management efforts also help protect the condition of watersheds, wildlife habitats, and recreation areas.

Nationwide, program expenditures totaled $60 million—$41 million in Federal funds and $19 million in State funds. Federal funds supported all program and suppression activities on Federal lands, plus 27 percent of program activities and 44 percent of suppression activities on State and private lands. State cooperator funds supported the balance of cooperative program and suppression activities.

Surveys and Technical Assistance

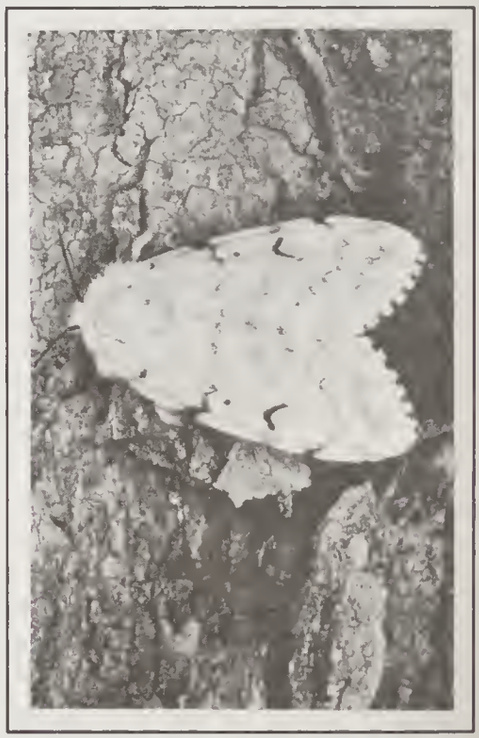
The Forest Service conducted aerial and ground surveys to detect and evaluate vegetation damage or pest populations on 101 million acres of National Forest System lands and 29 million acres of other Federal lands. With Forest Service assistance, State forestry organizations conducted similar surveys on 441 million acres of State and private lands. Managers of affected lands received the results of the surveys along with recommendations and advice about the suppression alternatives that are available.

In response to concerns by members of Congress about the health of the Nation's forests, the Forest Service implemented its Forest Health Plan. This plan provides a nationwide forest health monitoring system, and it emphasizes managing forests to reduce susceptibility to pest outbreaks rather than relying predominately on suppression measures.

Prevention and Suppression

Pest suppression projects protected an estimated 847 million cubic feet of merchantable timber. In addition, we salvaged an estimated 26 million cubic feet of insect-infested timber.

Forest Pest Management staff assisted Federal managers with gypsy moth suppression projects on 32,500 acres of National Forest System lands in Pennsylvania and Virginia, and on 10,800 acres of other Federal lands in Maryland, Virginia, and West Virginia. We also assisted State agencies with projects on 701,600 acres of State and private lands in Delaware, Maryland, Michigan, New Jersey, Pennsylvania, Virginia, and West Virginia. This is a decrease of 1,700 acres from the 746,600 acres treated in 1988.



Gypsy moth populations continue to appear in new areas. F.S. Photo

The Forest Service conducted eradication projects to prevent the gypsy moth from becoming established in new areas. These projects were conducted on 6,800 acres of National Forest lands in Virginia and Utah.

In addition, the Forest Service cooperated in eradication projects on 15,940 acres of State and private lands in Utah, North Carolina, Virginia, and Idaho.

We performed southern pine beetle suppression on approximately 9,750 acres of National Forest System lands, and assisted other Federal managers on 2,000 acres of other Federal lands and State managers on 11,200 acres of State and private lands. Suppression activities protected about 38 million cubic feet and salvaged an additional 21 million cubic feet of pine timber.

Western spruce budworm suppression projects in Oregon protected about 0.7 million cubic feet of merchantable timber. Forest managers applied treatments to 30,900 acres of National Forest System lands. This is a reduction of 567,500 acres from the 598,400 acres treated in 1988 and reflects the success of treatment in previous years.

Mountain pine beetle suppression occurred on 129,700 acres of National Forest System lands and 4,600 acres of State and private lands. Approximately 9 million cubic feet of timber were protected and an additional 3 million cubic feet of timber were salvaged.

The Forest Service conducted Douglas-fir tussock moth suppression projects on 76,000 acres of the Lassen and Plumas National Forests and assisted the State with suppression on 7,000 acres of State and private lands in California. Suppression activities protected more than 42 million cubic feet of timber.

Pesticide Use

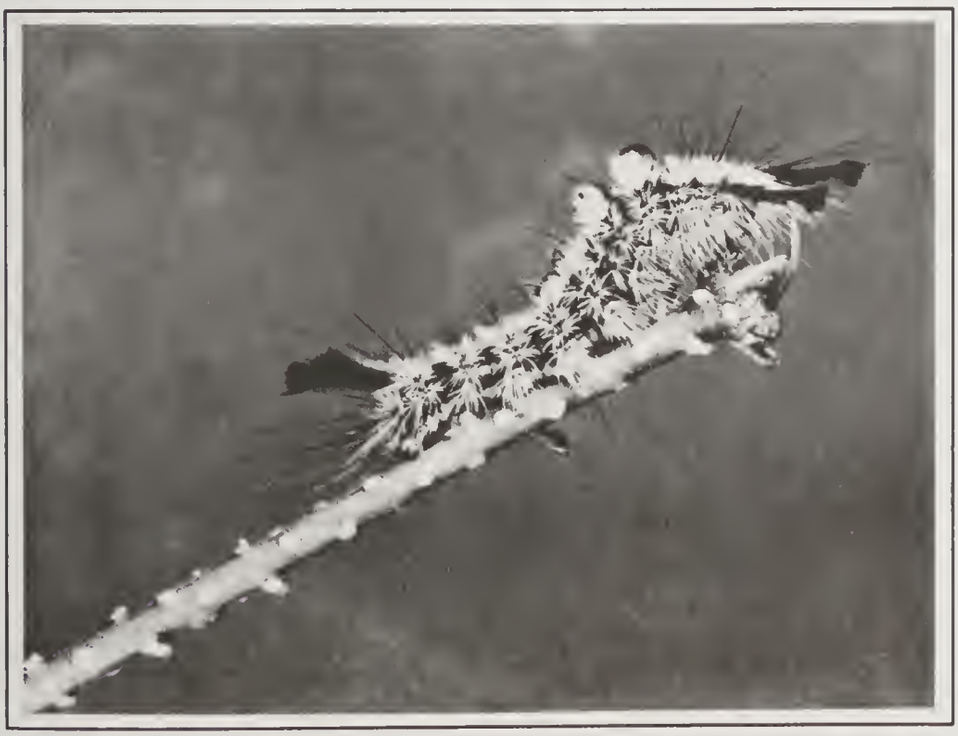
In 1989, 392,038 acres, less than 1 percent of the total acreage of the national forests and grasslands, were treated with pesticides. Treatments included 169,643 acres for insect and disease prevention and suppression, 121,493 acres for vegetation management, and 100,902 acres for animal control and other minor uses (table 47).

Pest Management Special Projects

The Appalachian Gypsy Moth Integrated Pest Management Demonstration Project is a multiyear, multiagency project designed to show that the spread of gypsy moths can be slowed and the negative effects reduced in infested areas. In 1989, we treated approximately 42,000 acres to reduce high gypsy moth populations in the project area. The materials used were Dimilin, an insect growth regulator; Bacillus thuringiensis (B.t.), a bacterial insecticide; and Gypchek, a virus.

First-year evaluations are underway to determine the effects of B.t. and Dimilin treatments on nontarget organisms and to evaluate the residual life of the insecticides. Other studies are underway to evaluate single versus double applications of the virus, use of mass trapping techniques, release of substerile male pupae, and combinations of these techniques.

The Forest Service continued participation in the National Agricultural Pesticide Impact Assessment Program. In 1989, 20 projects were designed to improve our knowledge of the benefits and risks of using pesticides in forestry. Most studies concentrated on the fate of pesticides in the environment.



Douglas-fir tussock moth suppression was needed for the first time in several years.
F.S. Photo

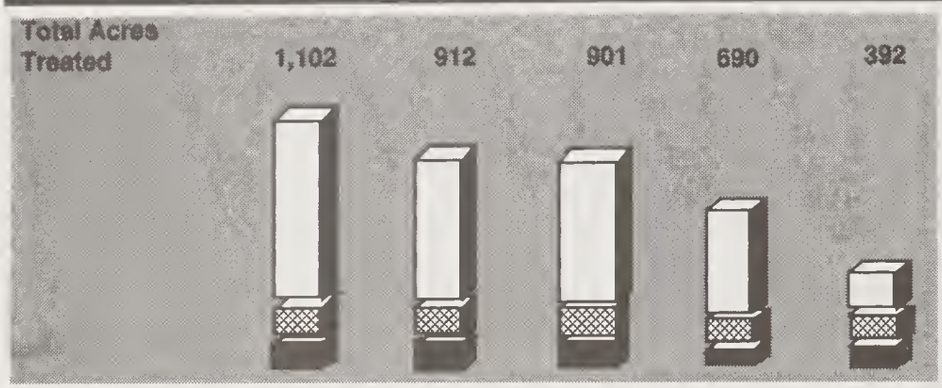
FOREST MANAGEMENT AND UTILIZATION

Forest Management

The Forest Management program cooperates with State forestry agencies who provide direct technical assistance to nonindustrial forest landowners for effective management of their forest lands. During 1989, this program helped landowners plan the management of 4.17 million acres, plant trees on 1.02 million acres, and improve the timber productivity on 232,000 acres of private forest land.

Throughout 1989, the Forest Service and the National Association of State Foresters jointly developed a broader approach, referred to as Forest Stewardship, in the management of nonindustrial private forest (NIPF) lands. The stewardship approach to management applies environmental and economic resource principles to forest resources and lands for the benefit of landowners and the general public.

Pesticide Use on National Forest System Lands



(Thousand Acres Treated)

	85	86	87	88	89
Insect and Disease Prevention and Suppression	834	645	641	485	170
Vegetation Management	151	141	151	116	121
Animal Damage Control	117	125	109	88	101

Numbers may not add due to rounding.

Stewardship management will result in multiple benefits from the NIPF lands that contribute to clean water and air, healthy fish and wildlife, quality outdoor recreation, and a continuous supply of forest products.

Utilization and Marketing

Marketing and utilization programs, designed to transfer the most up-to-date technology to wood-using industries, encourage efficient logging, processing, and marketing to minimize the impact of product demands on timber resources. A portion of this technology transfer effort includes preparing new technology for distribution to potential users. Ultimate distribution of this material is made through our traditional State Forester partners or directly to some user groups.

During 1989, this group completed several additional segments of the Integrated Mill Production and Recovery Options for Value and Efficiency (IMPROVE) system that was started in 1988. We have now distributed a total of 525 copies of these software programs for industry use. These programs are responsible for some of the improvements that domestic sawmills have made in operating efficiency during the past 2 years.

A portfolio identifying approximately 50 forest product technologies either finalized or under study at the Forest Products Laboratory and Experiment Stations is nearing completion. This series, TECH-LINES, describes a wide array of concepts, emerging technologies, recent developments, and state-of-the-art knowledge with reasonable potential for commercial application and use. This material will receive wide distribution as soon as it has been completed.

A monthly technology transfer newsletter, the Utilization and Marketing Review, was established in 1989 which is distributed electronically throughout the Forest Service and to universities, Cooperative Extension specialists, and State utilization and marketing specialists. The current distribution list includes about 375 individuals; many of whom duplicate all or portions of the newsletter for internal use. The newsletter provides current information on implementable research and technology transfer activities to assist both the scientist and user in the transfer of technology. Feedback from recipients has been very favorable.

Another program that was begun in 1988 was a computerized Forest Industry Data (FIND) national reporting system for State foresters and others to use in compiling

South Carolina Forestry Commission's refrigerated truck hauling approximately one-half million seedlings from State nursery to private forest owners. This truckload will provide enough trees to plant over 700 acres. Photo by Robert Hetzer

industry directories. Three informational workshops were presented in 1989 which has resulted in several more States adopting the system for their use. The Bureau of the Census has also expressed interest in adapting the program for its use.

Seedlings, Nursery, and Tree Improvement

This cooperative Federal-State program upgrades the quality of nursery operations and seedlings and improves the productivity and quality of non-Federal forests. The program achieves this objective by increasing seedling survival, shortening rotations, improving species resistance to disease and insects, and improving tree form and wood quality.

In 1989, an estimated 2.2 billion tree seedlings were produced and planted on approximately 3.4 million acres in the United States. Almost 90 percent of these seedlings were planted on private lands, primarily in the South. The Conservation Reserve Program, established as part of the Food Security Act of 1985, continued to increase tree-planting efforts.

With S&PF technical and financial assistance, State nurseries are producing record numbers of high-quality, genetically improved tree seedlings. More than 85 percent of all planting stock produced in southern State nurseries are now genetically improved. In 1989, the 88 State forest nurseries, previously developed with Federal and State funds, produced approximately 37 percent of the total seedling production in the United States and were the primary source of tree seedlings for nonindustrial forest landowners.

Seedling survival in 1989 was much improved over the drought year of 1988. In addition, Forest Service Conservation Reserve Program (CRP) tree planting reviews resulted in recommendations that improved reforestation success.

Forestry Incentives

The Forestry Incentives Program (FIP) and the forestry portion of the Agricultural Conservation Program (ACP), administered by the Agricultural Stabilization and Conservation Service (ASCS), provide financial incentives to owners of nonindustrial private forest lands for reforestation and timber stand improvement. ASCS transfers funds to the Forest Service for the technical assistance aspects of these programs.

The Forest Service participated in the annual NAACP Conference held in Atlanta. Efforts were made to increase minority contracting. Photo by Karl Perry

FIP and ACP account for much of the reforestation on nonindustrial private forest lands and are important in meeting national wood supply needs. In 1989, FIP's efforts resulted in an estimated 147,128 acres receiving treatment. During the same period, ACP treated an estimated 151,981 acres. These treated acres included 121,002 acres of reforestation for FIP and 130,749 acres for ACP.

The CRP was established under the 1985 Food Security Act to remove highly erodible cropland from production. Congress established a goal of 12.5 percent tree planting out of a total goal of 40 to 45 million acres of land in the Reserve. In 1989, approximately 484,000 acres were enrolled for tree planting. To date, after nine enrollment periods, CRP contracts for tree plantings on highly erodible croplands total about 2.2 million acres or approximately 6.5 percent of the total 34.0 million acres enrolled in the CRP program.

Urban and Community Forestry Assistance

The Urban and Community Forestry program promotes and improves the economic, environmental, and social well-being of communities through the planting and management of trees, shrubs, and other vegetation. These efforts enhance the urban environment and make important contributions to soil, water, and air quality. They also help reduce carbon dioxide in the atmosphere.

In 1989, financial assistance distributed to the States was approximately $2.1 million for urban and community forestry activities. State Foresters used these funds to provide technical assistance to more than 5,000 projects in communities whose populations totaled approximately 50 million people. Joint Federal and State program accomplishments in 1989 included the following:

- The National Arbor Day Foundation and the Forest Service presented 1,034 "Tree City USA" awards to communities for their effective commitment to tree planting and maintenance.

- The Neighborwoods program in Chicago has been ongoing for the last 3

Los Angeles flood prevention project debris basins, similar to this in the Santa Anita drainage, have stabilized channels and developed a lush riparian area.
Photo by Gordon Stuart

years and is an example of focused direct Federal assistance. Technical and financial accomplishments included Do-It-Yourself Urban Forestry workshops, tree planting in the Hispanic community, Little Village, public awareness announcements for Arbor Day, citywide recycling of Christmas trees, open-space boulevard replanting, and urban park development.

- Cooperative Forestry produced several urban forestry publications and an exhibit for public and professional use, such as:

  Technical Guide to Urban and Community Forestry in Washington, Oregon, and California

  Street Tree Factsheet

  Urban and Community Forestry—A Guide for the Cities and Towns of the Interior Western United States

  New Urban and Community Forestry Brochure

  New Urban and Community Forestry Exhibit

- Cooperative Forestry continued its outreach efforts in the minority community through partnerships with several national organizations—Historically Black Colleges and Universities, the National Urban League, the National Association for the Advancement of Colored People, and the Congressional Black Caucus.

- The Forest Service and the American Forestry Association conducted a 30-State survey on the condition of the Nation's urban trees. Results of this survey will be printed and distributed to the public by early 1990.

- Cooperative Forestry and the National Association of State Foresters cosponsored a congressional tree planting ceremony on April 5, 1989, to commemorate National Arbor Day. Over 400 persons—joined by 20 Members of Congress and over 100 students from Van Ness Elementary School, the Department of Agriculture's adopted school—attended the celebration. During the ceremony, the Chief awarded the District of Columbia with its third consecutive Tree City USA award for excellence in tree planting and maintenance.

- The Forest Service, National Association of State Foresters, American Forestry Association, and International Society of Arboriculture developed a National Urban Forestry Information Network to service State and community foresters, practitioners, and researchers with bibliographic and "current event" urban forestry information.

Statewide Forest Resources Planning

The Forest Service provides technical and financial assistance to State Foresters to develop statewide forest resource plans that provide a framework for the States to evaluate alternative futures for resource economic and environmental development. In 1989, this program received $850,000. Combined with State dollars, this money sponsored workshops in three of the Nation's planning regions. The Forest Service helped States produce publications, complete marketing studies, and support planning staffs. A highlight of the year was the drafting of a common set of goals and objectives for resource planning by the 17 Western States.

Taxation

The Forest Service provides taxation assistance information to forest landowners. In 1989, a major accomplishment was the publication and distribution of Agriculture Handbook 681, Forest Owners' Guide to Timber Investments, the Federal Income Tax, and Tax Recordkeeping.

Cooperative Watershed Activities

The Forest Service is responsible for the forestry aspects of river basin studies and small watershed projects planned and installed by the Soil Conservation Service under the Small Watershed (P.L. 83-566), Flood Prevention (P.L. 78-534), and Emergency Watershed Protection (P.L. 95-334) programs. In 1989, the Forest Service participated in 49 river basin studies and in the planning of 69 watershed projects. Forest land stabilization treatment measures were also installed on 44 small watershed projects. Funds from the three

programs cited above paid for land stabilization on critically eroding areas and helped State Foresters provide technical assistance on forestry practices.

The Forest Service used funds from the Soil Conservation Service for forestry measures on five flood prevention watersheds. Primary activities included accelerated fire prevention activities on the Los Angeles and Santa Ynez watersheds in California, gully stabilization on the Trinity River in Texas and the Washita River in Oklahoma, and landowner assistance on the Potomac River in Virginia, Maryland, and West Virginia. In California, accelerated wildfire prevention measures are being applied to National Forest System land. The current program focuses on prescribed burning to reduce fuel loads in high hazard areas. Fuels treatments have been successful in reducing fire occurrence along heavily used roads.

Following high-intensity storms that occurred in several of the 1988 burned areas in Oregon, Washington, and Wyoming, the Soil Conservation Service and the Forest Service applied emergency watershed protection measures to prevent further damages. In these areas, National Forest System work was performed in cooperation with work on private land. In other areas, National Forests in Oregon and Utah used the emergency watershed funds to seed approximately 8,500 acres of private land as part of the burn rehabilitation program.

Resource Conservation and Development

The Forest Service is responsible for the forestry related activities of the Resource Conservation and Development Program (RC&D), which the Soil Conservation Service administers for the Department of Agriculture.

In 1989, Soil Conservation Service allocated RC&D funds to the Forest Service totaling $766,000 for 60 of the authorized 189 RC&D project areas throughout the United States. The funds were 80/20 cost-shared with 32 State forestry organizations. Forestry technical assistance was provided to local sponsors who contributed to improve economic, social, and environmental conditions in rural Resource Conservation and Development areas.

Examples of RC&D accomplishments include developing secondary markets to use small pine sawtimber and low-grade hardwood in Alabama, forming a North Shore Timber Cooperative in Washington, gaining support for having forestry a part of the curriculum in public school systems in an Arkansas Resource Conservation and Development area, developing an urban/wildland interface wildfire protection and suppression capabilities plan in Arizona, and employing two consultant foresters and several part-time workers in a forested county in northern Maine.

Cooperative meeting between Forest Service and Soil Conservation Service personnel on erosion control at Lake Tahoe. Photo by Gordon Stuart

SPECIAL PROJECTS

Boundary Waters Canoe Area

The Forest Service cooperates with the State of Minnesota, under the authority of the Boundary Waters Canoe Area Wilderness Act of 1978, to intensify forest management on forest lands owned by the State, its counties, and private citizens. The objective is to offset the loss of timber production caused by incorporating forest lands into the Boundary Waters Canoe Area Wilderness.

Minnesota has used about $3 million of federally appropriated money and about $750,000 of State funding each year since 1980 for this purpose. Intensified activities in 1989 included reforestation of 25,780 acres, timber stand improvement on 2,631 acres, nursery production of 21.1 million seedlings, development of management prescriptions on 13,922 acres, and improvement of 508 miles of forest access roads.

The program has successfully met its stated objectives, and 1990 will be the final year for the program. Lands of all ownerships are being improved. The State has developed excellent inventory data to identify opportunities for industrial expansion. Forest industries are responding by planning new facilities and improving existing plants. The road improvements are being planned to minimize impacts, yet, maximize economic opportunities to improve the forest land productivity.

Burton-Santini Act

The Burton-Santini Act (P.L. 96-586) authorizes the Secretary of Agriculture to make financial grants to local governments within the Lake Tahoe Basin to reduce soil erosion and water pollution. The Lake Tahoe Basin Management Unit works cooperatively with Placer and El Dorado Counties, California; the City of South Lake Tahoe, California; and Douglas and Washoe Counties, Nevada, in selecting projects. The Soil Conservation Service is also an active partner.

In 1989, local governments were awarded grants totaling $1.1 million for new projects. Local sources matched Federal funds with $3.8 million. Projects completed in 1989 reduced sediment delivery to Lake Tahoe by more than 13,000 tons. The work authorized by the Act has focused attention on erosion control and has greatly increased the erosion control expertise in local agencies.

Pinchot Institute for Conservation Studies at Grey Towers, the home of Gifford Pinchot, the first chief of the Forest Service. Photo by Blu Muir

Timber Bridge Initiative

Congress appropriated $2.7 million in 1989 to implement a Timber Bridge Initiative to introduce new bridge construction technologies and demonstrate their use across the country. This initiative has established a Timber Bridge Information Resource Center in Morgantown, West Virginia, cost-shared the construction of 80 bridges demonstrating modern timber designs, cosponsored 16 timber bridge workshops and seminars for State and local government administrators and engineers, and produced several brochures and other visual aids to promote this technology for years to come. The cost-shares for demonstration bridges have been matched at a ratio of more than 2 to 1.

Economic Diversification Studies

In 1989, Congress funded a $500,000 Economic Diversification Studies program which has helped 12 projects in 12 States find ways to diversify the economies of economically depressed rural areas. Funds went to local communities and local or State units of government to evaluate alternate ways to strengthen local economies that were threatened by reductions in supplies of raw material from National Forest System land or other ownerships.

For example, because manufacturing firms in Mason County, Washington, indicated a shortage of trained local workers, three courses were scheduled, in September 1989, at Olympic Community College, Washington, to enhance the skill levels for county residents. A training program for high school students seeking entry-level positions in the fast-growing local aerospace industry is being designed with help from local aerospace manufacturers and will be implemented in 1990.

The Idaho Department of Commerce hired a contractor to assist the communities of Adams and Valley Counties in diversifying their economies. In Valley County, the effort has focused on construction of a breakwater on Cascade reservoir at Cascade, Idaho. In Adams County, the 45th Parallel Visitors Center will provide tourism information to travelers in the area.

Tribal Government Program (Native American/Alaska Native)

A Forest Service Tribal Government Program began this year with the documentation of policy (FSM 1563) and the assignment of a Washington Office program manager. The program addresses the unique relationship of the Federal Government with Indian tribal governments and Alaska Natives. Actions are underway and vary from a total Rocky Mountain Region and Experiment Station strategy to individual forest, station, and area efforts of working with tribal governments in an ongoing manner.

The Pinchot Institute for Conservation Studies

The Pinchot Institute for Conservation Studies is located at Grey Towers National Historic Landmark, the ancestral home of Gifford Pinchot, in Milford, Pennsylvania. Its purpose is to examine and address emerging conservation issues. The Northeastern Area State and Private Forestry administers the Pinchot Institute.

The Institute emphasizes four programs: Conservation, to identify and seek innovative solutions to emerging natural resource issues; Conservation Outreach, to increase public awareness about natural resource conservation; Interpretive Services, to interpret land use and conservation in America; and Site Management, to provide stewardship for the historic resource.

In 1989, about 1,000 students participated in the Institute's conservation education programs. Also, about 1,000 interpretive house and garden tours were conducted for more than 13,000 visitors. Mansion and landscape restoration projects continued with funding contributed by the Forest Service and the National Friends of Grey Towers.

A 5-year plan for Grey Towers and the Pinchot Institute for Conservation Studies was developed to solidify the role of the site in conservation issue resolution, education, and interpretation.

Northern Forest Lands Study

In 1988, the Congress directed the Forest Service to study the effects of changes in ownership and management of large tracts of forested land in northern New England and New York. The study was to identify alternative strategies to protect the long-term integrity of the area and the traditional uses of land. The study area covers 26 million acres in four States and has for two centuries served as the basis of a viable forest industry. It provides critical wildlife habitat, open space, and important watershed and scenic benefits. Mostly open to the public for recreation, it is within 1 day's drive of 70 million people and is the nearest accessible wildland area.

The Governors of each of the four States (Maine, New Hampshire, Vermont and New York) appointed three persons to a task force to work with the Forest Service on the study. More than 90 people—representing the States, universities, and interested groups—participated in working groups and prepared papers to supplement the study. The task force held many public meetings and mailed two newsletters to 5,000 interested parties.

A long-range vision for the future of the northern forest was developed to guide the study process. People expressed support for the way it is managed today but emphasized that environmental and economic conditions could be improved.

The draft report was sent to the public for review on October 17, 1989. The final report will be completed in March 1990.

Centennial Trail

Federal funds were appropriated to construct a Centennial Trail that will connect Coeur d'Alene, Idaho, with the confluence of the Spokane and Little Spokane Rivers 16 miles northwest of Spokane, Washington. The trail will extend over a 60 mile route, following the Spokane River where possible. Native Americans have used this corridor for thousands of years. Work on the trail is ongoing.

Photo by Bill Wallner

Forest Research

Credibility Through Knowledge

Photo by Art Elling

INTRODUCTION

Forest Service Research develops scientific and technical knowledge to enhance and protect economic productivity and environmental quality on all of America's 1.6 billion acres of forests and associated rangelands. The Forest Service has the most extensive program of integrated forestry research in existence.

In 1989, Research appropriations totaled $138 million, approximately 12 percent of which supported cooperative studies with colleges, universities, other research organizations, and industry (table 56). The Agency received supplemental research support totaling $14.0 million from other sources, such as government agencies concerned with forest and rangeland management and various private sector institutions (for example, the Boyce Thompson Institute and the Institute of Terrestrial Ecology). Approximately 36 percent of these outside funds were awarded for extramural research.

Research results provide new knowledge and technology that reduce the costs, improve the productivity, and enhance the efficiency of forest management while protecting or improving environmental quality. Our investigators devote special attention to multifunctional and long-term natural resource issues of national and international scope.

The eight regional Experiment Stations and the Forest Products Laboratory in Madison, Wisconsin, conduct studies that range geographically from the Tropics to the Arctic and from Hawaii and territories in the Pacific to Puerto Rico in the Atlantic. More than 2,800 studies are in progress at any one time, involving approximately 724 Forest Service scientists stationed at 74 locations.

The Forest Service plans and coordinates its research with related efforts at the 61 forestry schools and the agricultural experiment stations of land-grant institutions throughout the United States. Agency scientists also work closely with researchers from other public agencies and the forest industry.

Many of our scientific results help improve the management of the National Forest System's resources. Other major beneficiaries of Forest Service research results include Federal, State, and private land managers, public policy officials from all levels of government, and the wood-based industries, such as pulp and paper, housing, and furniture manufacturing. Research results are disseminated to users through publications (table 57), symposia, workshops, and direct contacts.

The research program supports international forestry in cooperation with other Federal agencies, non-Government organizations, the United Nations, and bilateral arrangements with several foreign countries.

STRATEGIC PLANNING

The Deputy Chief for Research and the Station and Staff Directors are developing research program direction for the future. This effort, called strategic planning, has involved looking at trends in renewable natural resource management, projecting research needs, and setting program goals for the future. Research has considered the strengths of the organization and looked outward to see how programs might adjust to clients' changing needs.

PRIORITY RESEARCH PROGRAMS

Forest/Atmosphere Interactions

The Forest Response Program. Congress, environmental groups, the wood products industry, and the general public are concerned about the effects of acid deposition and associated air pollutants on the Nation's forests. Forest declines, believed by some to be caused by air pollutants, have been reported for sugar maples, eastern high-elevation spruce and fir forests, natural southern pine forests, and ponderosa and Jeffrey pines in southern California.

Since 1984, the Forest Service, the Environmental Protection Agency, and the forest industry (through the National Council of the Paper Industry for Air and Stream Improvement) have supported hundreds of university, private, and government researchers in investigating the factors involved in complex multiple-stress-related forest declines. We have begun to document the effects of acid deposition and ozone on forests, with special emphasis on high-elevation spruce and fir forests, southern pines, eastern hardwoods and western conifers. The results seem to indicate that air pollutants are a source of stress that adversely affects forests in several regions of the United States. Specific highlights are as follows:

- **Red Spruce.** Many red spruce have died at high elevations in the Northeast since the early 1960's, and a growth decline has been reported for red spruce throughout its range. Acidic cloud water is making red spruce in the mountains of the Northeast more susceptible to winter injury. Nutritional imbalances resulting from losses of calcium and other tree nutrients may be further weakening red spruce. In the southern Appalachians, acid inputs may cause aluminum to reach levels in the soil that prevent the uptake of important nutrients.

- **Southern Pines.** Based on projections from computer models, current levels of acid deposition may cause changes in soil chemistry on some sites within 50 years. No short-term negative effects are seen on seedlings treated with ambient levels of acid rain. Ambient concentrations of ozone, however, reduced the growth and damaged foliage in pine seedlings. Ozone, in combination with many natural stresses, such as drought, root diseases, insects, and hardwood competition, may have played a role in reducing pine growth in natural stands in North Carolina, South Carolina, and Georgia. Only limited research has addressed the interaction of pollutant stress and natural stress factors in this region, so the effect on forests is not known.

- **Eastern Hardwoods.** In general, hardwoods are doing very well. In controlled studies, only the acid rain treatments applied to low-base soils produced negative effects on seedling growth. Field evidence is accumulating that sulfate deposition is affecting soil chemistry, but impacts on forest production are limited to unglaciated low-base soils of the oak-hickory region. No discernible direct effects from acid rain have been found in forests of north-central Pennsylvania; however, ozone does induce early leaf senescence and height-growth reduction of several important species. The North American Sugar Maple Decline Project has just completed its first year of observations and analyses of pollutant effects and has given sugar maple a clean bill of health on 166 permanent plots in the United States and Canada.

Rocky Mountain Station scientists adjust a complex array of sensors that measure concentrations of trace gases in the air, along with air temperature, wind speed, and direction. Photo by Rick Fletcher

- **Western Pines.** Ponderosa pine is the western tree species most sensitive to ozone exposure in controlled experiments, but it is not affected by acid rain. Ozone has caused visible damage and reduced growth and has weakened ponderosa pines in the San Bernardino Mountains adjacent to the Los Angeles basin in California to such an extent that they have been susceptible to attacks by bark beetles and root pathogens.

Global Change Research. We know that climate variations provide an initial ecosystem stress that often leads to critical stress by other factors, such as air pollutants. Evidence is mounting that the Earth's climate is changing and that these changes will have a major effect on forest ecosystems.

The Forest Service Global Change Research Program has been fully incorporated in the U.S. Global Change Research Program, as documented in the July 1989 Research Plan. The overarching goal of the U.S. Global Change Research Program is to gain a predictive understanding of the interactive physical, geological, chemical, biological, and social processes that regulate the total Earth system. As a result, the U.S. program emphasizes the need to understand the impacts of global changes on forest ecosystems and the impacts of forest management practices on the global environment. The Forest Service program emphasizes the Ecological Systems and Dynamics science element of the U.S. plan and subdivides this element into Northern, Southern, Interior Western, and Pacific Western categories to provide cohesive Regional forest ecosystem-based approaches within the national program.

Forest Management in the Wildland/ Urban Interface

As our cities continue to expand and people relocate into forested areas, more homes, schools, and developments are intermingling with our wildlands. The resulting transition area or interface creates opportunities for greater segments of the population to experience wildland environments. However, this also creates a significant problem in fire protection, as well as land-use planning and outdoor recreation, in the wildland/urban interface. When both structures and natural resources are threatened, the potential for fire disasters involving loss of property and human lives increases each year and can overwhelm local, State, and Federal firefighters.

In its second year, the Fire Research program supports the National Wildland/ Urban Fire Protection Initiative jointly sponsored by the Forest Service, the National Fire Protection Association, the U.S. Fire Administration, and the National Association of State Foresters. Research addresses and provides useful knowledge on the following dimensions of this complex problem:

- Risk assessment and hazard appraisal that take into account the mix of structures and wildland fuels.
- Behavior and effects of wildland fires entering interface zones.
- New fire management strategies to meet interface realities.
- Analysis of the "people" part of the problem (that is, the social, political, and economic factors at work).

- A new focus on recreational interactions in the interface zone.

This past year, Congress appointed the Forest Service and Johns Hopkins University to develop a comprehensive plan to summarize the state of knowledge about the effects of wildfire smoke on firefighters and outline information needs to evaluate the health hazards of exposure to forest fire smoke. In January 1989, under the auspices of the National Wildfire Coordinating Group, Forest Service Research sponsored a workshop that resulted in a study plan identifying specific data and research needs on the effects of forest fire smoke on firefighters. Participants included firefighters, union leaders, fire management specialists, occupational health specialists, medical doctors, toxicologists, industrial hygienists, and a variety of scientists from State, Federal, and academic institutions.

International Trade and Competitiveness

The United States is both a major exporter and importer of forest products. Trade patterns are both complex and dynamic as world shipments of forest products continue to increase. To increase the U.S. export share, it is critical to identify emerging trends, constraints, and opportunities for expanding wood products exports.

Government and wood industry planners are using Forest Service economic research expertise and findings on international forest products trade. We have documented current regional timber and solid wood product trade patterns. Southern exports of wood products surged for the third consecutive year in 1988. Foreign sales totaled $804 million, over 50 percent above the previous high of $530 million in 1987. Southern pine lumber exports achieved levels not recorded since the early 1930's. While a weak dollar has made southern wood products more competitive overseas, useful research findings and market development efforts have helped inform and educate potential exporters and others about opportunities in foreign markets.

Eastern hardwood product exports increased 134 percent in dollar volume between 1985 and 1988. The growth markets for hardwood lumber have been Japan, Great Britain, and Italy. Japan and Canada were the largest markets for hardwood lumber in 1988, while West Germany was the largest for hardwood logs.

Timber trade issues in the Pacific Northwest and Alaska are perhaps the most complex and controversial. Research at the Pacific Northwest Forest and Range Experiment Station on the Pacific coast log and lumber export trade, which totals approximately $3 billion annually, has produced a better understanding of prospective markets in Pacific Rim countries for timber and solid wood products produced on the U.S. Pacific Coast. The research includes the likely impact of several proposed changes in public policies on timber exports from Federal and State-owned forest lands.

Forest Insect and Disease Outbreaks

Insect and disease losses reduce the production of the Nation's forests. Outbreaks of forest pests have increased in both frequency and severity over the past 20 years as the forests of the United States have become increasingly prone to attack. Managers need tools for early identification of impending outbreaks, less costly and more effective ways to stop or diminish outbreaks, and ways to reduce environmental hazards that could result from control actions.

The Pest Outbreak Priority Research Program accelerates the development of safe, effective tactics for delaying and suppressing outbreaks of major forest pests. Recent accomplishments include: an improved aerial spray of Gypchek, a natural virus of the gypsy moth that does not harm the environment and can be used near human habitations and sensitive areas, such as bodies of water; a cooperative research effort that has begun to improve methods to predict the onset, duration, and severity of outbreaks of the southern pine beetle and to develop more effective prevention and suppression techniques; and evidence that the use of forest fertilization may be a safe and effective option for reducing western spruce budworm damage to western forests.

Critical Wildlife and Fish Interactions With Timber Management

Compliance with the Endangered Species Act, the National Forest Management Act, and other laws and regulations often leads to conflicts between protecting wildlife and fish and producing a sustainable flow of forest products. Many of these wildlife-timber conflicts can be resolved with a better understanding of interactions between wildlife and fish habitat needs and timber management actions. In 1989, research addressed the following problem areas:

- Old-growth management alternatives and consequences in relation to sensitive wildlife species. The red-cockaded woodpecker and spotted owl are the major subjects of this research.
- Wildlife associations in forested riparian habitats and tropical forests.
- Determination of the cumulative effects of forest management alternatives on anadromous fish habitats.
- A new study of elk, deer, and cattle interactions in eastern Oregon, including their responses to various methods of timber management.
- The development of models that will predict population trends in intensively managed forest areas.

Southern Forest Productivity

By the turn of the century we will be dependent upon the South to produce half of the Nation's wood and wood fiber products. To sustain this level of production, the rate of growth of southern timber needs to be improved.

In 1989, the Forest Service accelerated research to develop solutions to declining

timber growth in the South and to identify ways to raise southern forest resource productivity on Federal, State, and private forest lands; resolve conflicting or competing uses of the southern forest resource that tend to reduce timber yields; and develop management methods that will increase southern forest productivity without adversely affecting environmental quality.

We are applying biotechnology to augment tree growth, improve tree form and wood quality, and lessen the impacts of insects and diseases. We are conducting studies to understand the biological processes and environmental factors affecting forest productivity. We are developing silvicultural alternatives (as opposed to chemical herbicides and other pesticides) to control weeds and to simultaneously integrate pest management strategies. We are investigating timber management and habitat management options that will maintain and protect wildlife populations and watersheds. To round out this research effort, we are also conducting research to improve harvesting methods and wood use that will extend and protect the southern forest resource.

1989 RESEARCH HIGHLIGHTS

Fire and Atmospheric Sciences Research

The objectives of this research are to provide Federal, State, and local fire management agencies with the knowledge and tools needed for safe, efficient, and cost effective fire control. Examples of accomplishments include the following:

Fire Behavior Models. Through laboratory testing and field research, computer systems now provide fire-related information on hundreds of plants, animals, and communities. This makes it possible for fire behavior models to combine fire danger information with fire behavior predictions for a better understanding of the complex interactions of fuel, terrain, and weather. These interactions affect movements of fires, fire intensity, the kind and amount of smoke produced, soil effects and subsequent regeneration expectations, and ecological responses.

Emissions From Large Fires. Intermountain Station researchers are studying behavior and effects of large fires in cooperation with Forestry Canada, the Defense Nuclear Agency, the National Institute of Standards and Technology, universities, and other agencies. Experiments measured rate of heat release, fire-induced winds, and fire spread. The researchers studied gases and particles released from fires from ground towers, through airborne samplers flown through convection columns, and at various distances from the fire.

Ozone-Affected Forests. Research on forest trees suggests that current air quality standards for ozone are insufficient to protect trees from ozone damage. Any increases in ozone emissions will only increase forest damage. Over the past decade researchers in the Pacific Southwest have shown that the severity of ozone injury directly correlates with increasing exposure from north to south.

The growth of affected Jeffrey pines in southern California has been reduced significantly during the past 20 years. Ponderosa pine seedlings had significantly reduced photosynthesis and growth with concentrations of ozone simulating those in southern California. Root growth is inhibited more than shoot growth, reducing the seedling's ability to store carbohydrates and compete for soil moisture. Southeastern researchers found that southern pines had similar growth-reduction responses to ambient ozone concentrations.

Forest Insect and Disease Research

The objective of insect and disease research is to develop ways to prevent, reduce, or forestall damage to forests and rangelands by insect and disease pests and to protect wood in use and in storage from termites, boring insects, and decay. Examples of accomplishments include the following:

Even though the winds were predominantly from the southwest at 8 to 12 miles per hour, the fire-induced winds were "drawn" toward the center of the fire area, with wind speeds exceeding the ambient conditions by a factor of 2 to 3. Photo by Darold E. Ward

Pheromones. Forest Service researchers are working with partners in universities and industry to study and use pheromone-induced behaviors of insects to reduce forest damage. Mating disruption is being used against the Douglas-fir tussock moth, spruce budworms, other shoot borers, and some seed orchard

pests. Antiaggregation pheromones prevent bark beetles from congregating on trees or logs already colonized.

We are testing the use of these pheromones against several species and reviewing for registration the use against the Douglas-fir beetle. Pheromones have many advantages over pesticides: they are highly target selective, do not kill, do not harm beneficial insects, are easily degraded, and are typically applied in minute amounts.

Nitrogen Fertilization. Pacific Northwest Station researchers found that fertilizing budworm-infested stands with nitrogen reduces defoliation and significantly increases radial and shoot growth of infested trees. Although budworms increased in numbers and size, the added nitrogen apparently stimulated growth of more foliage than the increased population consumed.

Gypsy Moth Defoliation Study. Gypsy moth management currently emphasizes suppressing rising populations before they cause defoliation. Outbreaks are patchy, however, and predicting where next year's outbreaks will arise is difficult. Northeastern Station researchers, collaborating with the University of Massachusetts, compiled and analyzed 26 years of New England defoliation maps. The results showed that regions can be identified where gypsy moth populations develop outbreaks synchronously. An outbreak in one area increased the probability of other outbreaks beginning nearby, but suppression of an outbreak in one area is unlikely to prevent outbreaks 1 kilometer or more away.

Western budworm moth attracted to a PVC pellet which releases a sex-attractant odor.
F.S. Photo

Gypchek. A vastly improved formulation of Gypchek, a natural virus product that kills only gypsy moths, produced excellent control in recent aerial spray trials in Maryland and Virginia. Northeastern Station scientists found that adding a sunscreen prolonged virus activity and greatly enhanced its effectiveness. Two Gypchek applications 3 days apart controlled populations as well or better than chemical or other biological insecticides and with no adverse effects on nontarget organisms.

Forest Inventory and Analysis

Forest industries, financial consultants, and State resource planners use forest inventory data, monitoring surveys, and results of analyses as a basis for industry expansion decisions, financial investment analysis, State forestry programs, and public and private forest policies. Examples of accomplishments include the following:

Inventory Data Base. Researchers from the four eastern Experiment Stations have developed a standard electronic format and coding system—the East-wide Forest Inventory Data Base—to deliver forest inventory data to resource analysts on a consistent basis for 28 eastern States. Investigators will now be able to compute estimates of forest resource characteristics for any selection of States, counties, or other user-defined areas in the Eastern United States, using commercially available computer software.

Atmospheric Pollution Study. Systematic analyses of data from Pennsylvania's extensive atmospheric deposition monitoring system and remeasurements of permanent forest survey plots maintained by the Northeastern Station's Forest Inventory and Analysis Unit indicate that Pennsylvania's forests are not suffering a significant decline attributable to acid precipitation. The study analyzed forest and tree growth at varying levels of acid precipitation and also accounted for natural influences on forest growth, including drought and insect defoliation. It found a significant reduction in growth rate for only three tree species, two of which had been severely affected by gypsy moth defoliation in the past decade.

Southeastern Timber Inventories. Inventories of pine timber have been increasing in the Southeastern United States for as long as most practicing foresters can remember. Recent forest surveys of South Carolina, Florida, and Georgia, however, indicate that pine timber volumes in the region have peaked, at least for now. The reasons for the downturn include increases in pine timber removals, reductions in growth in some places, and decreases in acreage of pine stands. Southeastern Station resource analysts believe that current planting rates are sufficient to sustain existing levels of pine timber harvests; however, the continued expansion of forest industry will require a greater use of hardwoods.

Renewable Resources Economics Research

Forest Service economics research develops and applies methods for analyzing forest management investments and the responses of domestic and international forest products markets to economic, technological, and institutional forces. Economics research contributes directly to national forest management decisions and to the development of both public and private forest management programs. Individual landowners and forest products processing firms use the results to manage their resources efficiently. This research also contributes valuable information needed for formulating international trade policy. Examples of accomplishments include the following:

National Timber Productivity Measures. Measures of productivity are important in characterizing the performance of the U.S. economy. The Department of Agriculture has published productivity indexes for the U.S. farm sector for decades, yet no national productivity indexes have been reported for U.S. forest resources. Economists at the USDA Office of Budget and Program Analysis, the Forest Products Laboratory, and the Forest Service Washington Office developed national measures of forest productivity for timber. These productivity measures reflect the performance of forests as measured by annual timber growth and harvest yields in relation to the timber inventory and timberland area. They provide a concise and comprehensive view of overall timber productivity in the United States for the past 35 years.

Timber Supply-and-Demand Analyses. In recent years, timber industry and State officials raised issues over the adequacy of the timber supply components in land management plans for the national forests in Montana, Idaho, and southern Appalachia. Forest Service economists developed data and detailed analyses of the timber supply-and-demand outlook to improve the information for National Forest land management planning and decisions on timber supply objectives for these States and regions. The work of Forest Service resource economists has provided a more factual basis for resolving land management planning issues.

Backpackers and hikers can cause damage to forest land without proper management. These hikers on the Bob Marshall Wilderness Area in Montana typify the problem of trail erosion caused by walking side-by-side.
F.S. Photo

Forest Recreation Research

Recreation research provides land managers with the technology to supply more and higher quality outdoor recreational opportunities. It also develops the knowledge to manage vegetation in and near urban areas for optimum economic, social, and environmental benefits. Examples of accomplishments include the following:

Beneficial Tree Planting. Summertime temperatures in cities are 5 to 7 degrees Fahrenheit higher than the countryside, which cost Americans billions of dollars for air-conditioning. Using computer simulations for different types of trees and various placements around buildings, researchers projected annual energy use in residences. They determined nationwide that planting the right trees in the right locations near homes has the potential to reduce summer cooling costs by 50 percent and winter heating costs by 15 percent. Planting, maintenance, and water costs were found to be small compared to energy savings and environmental benefits. The added trees further cool the urban environment as they transpire (evaporate) water from their leaves. As the trees grow, they take in carbon dioxide, thus reducing its accumulations in the atmosphere.

Environmental Change Guide. Color photographs, taken periodically from a fixed point, can serve as a cost-effective early warning system to monitor the impact of recreational activity on the ecological and aesthetic conditions of outdoor recreational sites. Using color photos, researchers have developed an illustrated guide to help land managers detect and interpret the often subtle changes in trees, other vegetation, and soils that can be captured by color photographs or slides. The guide uses slides taken a number of years apart to demonstrate how to evaluate a variety of situations, including scenic landscapes, recovery after timber harvesting, disturbed sites, and developed recreational sites.

Trees and Timber Management Research

The objective of timber management research is to enhance the productivity, quality, and multiple-use benefits of forested lands through development of improved silvicultural practices and management guidelines. Examples of accomplishments include the following:

Tropical Forests. Researchers at the Southern Station (Puerto Rico) and Pacific Southwest Station (Hawaii) are conducting research on biodiversity; watershed, wildlife, and ecosystem management; wood production; and agroforestry. Products of their research include monographs on tree species native to Puerto Rico, management of wildlife in the Caribbean, establishment and management of eucalyptus plantations in Hawaii, agroforestry systems, forest land use in Latin America, biological diversity in the tropics, ecosystem rehabilitation, and fresh- and salt-water wetlands in the tropical and temperate regions.

Publication for Central State Forest Landowners. Working cooperatively, the Northeastern, North Central, and Southern Forest Experiment Stations, Northeastern Area (State and Private Forestry), the Eastern Region, and many universities, State conservation agencies, and private industries compiled Central Hardwood Notes to help landowners manage their forests. A compendium of 85 of these notes (in three-ring binder format for ease of updating) summarizes 50 years of research results and management experience for land managers of the region. The diverse forests of the Central States include more than 70 species of hardwoods, several conifers, many shrubs and herbs, and a host of animals.

Bottomland Hardwood Regeneration. Researchers at the Southern Hardwoods Laboratory in Mississippi developed methods of planting seedlings of many tree species and for direct-seeding oaks to regenerate many acres of former wetland forests that were converted to agriculture over the past three decades under the Conservation Reserve Program. To date, survival of seedlings established using this methodology has averaged 70 to 75 percent for oaks and 85 to 90 percent for other bottomland hardwoods. State and Federal agencies are already using results of the research.

Ecosystem Studies. A team of Pacific Northwest Station and university researchers working with managers from the Willamette National Forest has fostered innovative approaches to managing forest landscapes that sustain ecological integrity while producing commodities. Some applications of their findings include retention of woody debris and green trees for wildlife habitat and biological diversity, design of cutting patterns to minimize fragmenting of interior-forest habitat, and the management of riparian zones.

Sampling the chemical content of streams also measures the status of aquatic resources and provides an understanding of forest nutrient cycles. F.S. Photo

Pine Stand Management in the South. Research by scientists at the Southern Station and field trials on national forest and private lands has developed low-cost, environmentally-safe control treatments using both backpack and tractor-mounted sprayers to control unwanted hardwoods and woody and herbaceous vegetation in understocked pine stands. The methodology has also reduced costs for herbicides, adverse environmental effects, and the potential for lawsuits. A manual prepared cooperatively by the Southern Station, Southern Region, and the Auburn University School of Forestry explains procedures in layman's language and provides information about herbicide labels, safety, State regulations, and business considerations for contractors has been widely distributed and accepted.

Douglas-fir Management in the Northwest. Use of herbicides to control red alder in Douglas-fir plantations was pro-

hibited on national forest land in the Northwest in 1984. The Pacific Northwest Station and the Siuslaw National Forest undertook studies to find substitute methods determining how alder sprouting was related to the age at which trees are cut, stump height, cutting angle, and the month in which they are cut. This research produced guidelines for red alder control without herbicides, which have been widely distributed and are being used by national forests, the Bureau of Land Management, and the Oregon Department of Forestry.

Watershed Management and Rehabilitation Research

Watershed research develops and tests new, cost-effective methods for rehabilitating lands disturbed by surface mining and for protecting, managing, and improving forest and rangeland watersheds. Examples of accomplishments include the following:

Improved Erosion Prediction Models. An interagency (Departments of Agriculture and the Interior) program is improving erosion prediction models to make more reliable predictions in a wide variety of environments. The models are based on a deeper understanding of erosion processes and simulate effects on whole watersheds as well as onsite erosion. The first new model has been released for testing and limited application. Expected benefits are more effective range management strategies to minimize erosion and better designs of forest roads to keep sediment out of streams.

Atmospheric Deposition Models. A 10-year research program has identified processes responsible for cycling and transporting compounds deposited from the atmosphere into ground and surface water. Sulfur and nitrogen compounds can cause shifts in water chemistry that mobilize nutrients and heavy metals, sending them to surface waters and affecting aquatic habitats.

Research in New Hampshire, Pennsylvania, and North Carolina has identified processes that affect soil nutrient cycling and variation in stream chemistry over time. In Minnesota, Wisconsin, and Michigan, researchers have identified how these processes affect lakes across a deposition gradient. On a watershed in West Virginia, deposition chemistry has been changed artificially to determine how watershed processes control stream chemistry. New information from these studies is used to modify models that predict the effects of sustained atmospheric deposition on watersheds.

Changing a filter on a sensor that collects tiny air-borne particles (dried deposition) that are subsequently analyzed for absorbed trace gases that may contribute to the "greenhouse" effect and global warming.
Photo by Bob Musselman

Water Flow Model. A Rocky Mountain Station economist, working with engineers and hydrologists, developed a computer model of the influence of timber harvesting on water flow, storage, and allocation in the Colorado River Basin. Under existing conditions, less than 25 percent of the increase in water flow from timber harvest would reach farms and cities. As the basin's population grows, however, the delivery rate of timber harvest-induced flows to farms and cities is likely to rise but remain below 50 percent. Production of electricity accounts for slightly more than half the value of the additional runoff. Improvement in water quality (by diluting pollutants) accounts for about 25 percent.

Methane Production Studies. North Central Station scientists are cooperating with colleagues at the University of Minnesota and the National Aeronautics and Space Administration on several studies that assess methane production from natural processes. Anaerobic bacteria in waterlogged soils are major producers of methane. The scientists combined methane measurements in peatland at the Marcell Experimental Forest in northern Minnesota with long-term environmental data to estimate total annual methane production from Northern Hemisphere peatlands—198 billion pounds. That amount can trap as much heat as one-fourth of the carbon dioxide released from burning fossil fuels each year.

Wildlife, Range, and Fish Habitat Research

This research develops the knowledge and technology for maintaining or improving wildlife and fish habitat, improving vegetative cover and condition of rangeland, and integrating wildlife, fish, and livestock production with other forest and rangeland uses. Examples of accomplishments include the following:

Riparian Grazing Recommendations. Researchers at the Intermountain Station and managers of the Intermountain Region have recommended standards for riparian grazing of herbaceous forage plants. These standards will help maintain the woody plant community and streambank structure of riparian grazing areas. A minimum height of herbage should cover the streamside at the end of the growing season to provide forage, maintain plant vigor, protect streambanks, and entrap sediments on meadow sites with easily eroded banks.

Guide on Habitats and Wildlife. The Forest Service and the Lake States Interpretive Association developed Northwoods Wildlife: A Watcher's Guide to Habitats to help the public understand how each wildlife species has specific habitat requirements and that each kind of habitat supports a

different wildlife community. This guide describes 18 habitats in Minnesota, Wisconsin, and Michigan, how they originated, how they change with time, and why they attract their particular wildlife community.

Native Plant Regeneration. The recovery plan in Hawaii for the endangered palila bird called for drastically reducing feral sheep populations in the palila's critical habitat to allow for the natural recovery of the native mamane forest tree upon which it depends. Forest Service researchers who monitored native plant recovery for five years after the sheep were removed found that native plants reoccupied the slopes of Mauna Kea and that mamane had regenerated naturally. Although tree-growth models predict that the palila may not measurably benefit until the 21st century, the Hawaiian Division of Forestry is committed to keeping sheep populations low, planting mamane where natural regeneration has failed, and preventing fire in existing stands.

Spotted Owl Populations. Pacific Southwest Station scientists have found California spotted owls nesting successfully in habitats ranging from montane conifer forests to foothill woodlands in the southern Sierra Nevada. At elevations from about 1,000 to 2,500 feet, the owls are permanent residents in foothill woodlands that include blue oak, interior live oak, and sycamore. Three of six pairs we studied nested in 1989 and produced at least one nestling each. The density of spotted owls in conifer forests last year was approximately the same as in foothill woodlands.

Pair of Spotted Owls roosting in an old-growth California buckeye at an elevation of about 1,400 feet in foothill woodlands on Secata Ridge, Sierra National Forest. F.S. Photo

Red-cockaded Woodpecker Recovery Plan. Working closely with the U.S. Fish and Wildlife Service, Southeastern Station scientists who have studied the red-cockaded woodpecker's habitat requirements for 10 years helped create a recovery plan on national forests and other public lands in the South. The plan calls for saving ample old southern pines for nesting and maintaining adequate acreage for foraging. Midstory trees will be burned or cut because they favor predators and competitors for nesting sites.

Long-term observations on the Francis Marion National Forest show that these habitat provisions work. Breeding pairs increased from 427 to 470 between 1980 and 1989. Hurricane Hugo, however, destroyed much of that carefully preserved habitat. Biologists from the Southeastern Station, the Fish and Wildlife Service, and the National Forest met in the field immediately to coordinate strategies for stabilizing and restoring the population. Experiments had shown that the birds roost and nest in artificial cavities, so the team used power tools to cut cavities in large standing pines where nest trees had toppled. The birds are now using more than a third of the 55 artificial cavities.

Red-cockaded woodpecker population increases. Photo by S.C. Langston

Forest Products and Harvesting Research

Forest products and harvesting research provides the American public and forest industries with information, technology, and knowledge to more efficiently use our forests. Examples of accomplishments include the following:

Timber Removal. Harvesting research units at our Research Stations design, develop, and test new techniques to remove timber economically and efficiently with minimal disturbance to the environment. Forest research in 1989 improved

harvesting methods using skyline logging, continuous cables, semi-walking machines, vehicles with wide and low-pressure tires, track-laying vehicles, and balloons and helicopters to help transport logs and reduce forest damage.

Forest Road Erosion Control. Intermountain Station researchers have compiled a guide that considers the entire road cross section in controlling soil loss from running surfaces, ditches, cutslopes, and fillslopes. The percentage of ground cover is the principal controlling variable, although the success of treatments also depends on slope and surface silt content.

Biomechanical Pulping. Researchers at the Forest Products Laboratory are exploring a completely new technique—biomechanical pulping—to reduce energy requirements, chemical and other waste effluents, and increase pulp yields and paper strength. Wood is treated with selected wood-decay fungi before mechanical pulping, resulting in large energy savings and stronger paper. A consortium of 30 Forest Product Laboratory and University of Wisconsin researchers and 18 pulp and paper companies, providing partial funding and an industry perspective, cooperates on this research.

Tannin-Based Adhesives. A Southern Station researcher and a consulting firm have collaborated on mill-scale trials applying the tannin-based adhesives developed in the laboratory for end-jointing lumber. The mill trials show that bonds equivalent to those found in the laboratory can be achieved in the mill. Half the resorcinol normally used, at $1.90 per pound, can be replaced with tannin extract from southern pine bark at $0.25 per pound, and expensive radio-frequency curing is not needed.

INTERNATIONAL FORESTRY

The International Forestry program provides leadership, coordination, and direction for Forest Service activities with other countries and international organizations. In 1989, the program had numerous accomplishments. We developed a Service-wide policy calling for an expanded role in technical assistance, cooperative research, training, and support to international organizations, especially for tropical countries.

The Forest Service expanded its cooperation with the United Nations Food and Agriculture Organization (FAO) by:

- Providing a remote sensing specialist for a 2-year period at FAO headquarters in Rome to help complete a 10-year assessment of the world's tropical forests.
- Participating in field visits to implement the Tropical Forestry Action Plan in the Caribbean and Mexico.
- Cooperating with Canada in providing technical assistance to Mexico following damage to the forests in Yucatan by Hurricane Gilbert, through the North American Forestry Commission of FAO.

We also increased our cooperation with the International Tropical Timber Organization (ITTO) by:

- Conducting investigations on tropical wood use at the Forest Products Laboratory.
- Lending ITTO a specialist from the Institute of Tropical Forestry for advisory missions to Malaysia.
- Providing a technical advisor to assist the Departments of State and Commerce delegates at the ITTO conference in Africa.

We also work with the World Bank. We provided two Forest Service members to a World Bank team to help advise Brazil on reorganizing its national forestry structure and operation. We also provided a short-term advisor on environmental monitoring to a World Bank project in Mexico.

The Forest Service conducted technical reviews of approximately 90 project proposals for the World Bank, the State Department's Man and the Biosphere Program, and ITTO. We advanced 23 cooperative research projects in seven countries. These projects addressed new technologies in agroforestry, fire management, insect and disease protection, regeneration, tree genetics, forest ecology, air pollution evaluation, and forest

A large rainfall simulator is used to measure sediment production from 100-foot long road sections, including cutslope, ditch, and running surface. F.S. Photo

products testing, development, and marketing. We also hosted more than 300 forestry and natural resources students and professionals from 60 countries, including 28 participants during the fifth annual International Seminar on Forest Administration and Management.

The Agency participated in 12 science and technology exchanges with 14 countries in eastern and western Europe, Asia, Oceania, and Latin America. These exchanges helped us gain new information on forest products technology, new management approaches to urban forestry and agroforestry, new data on the ecology of rain forests, insecticide resistance in plants, control of Armillaria and economically important termites, and habitat practices for forest wildlife and native salmon.

We continued our strong cooperation with Mexico. The Agency assigned a full-time forester and several short-term consultants to the U.S. Agency for International Development (A.I.D.) in Mexico to provide assistance in nursery management, charcoal production, and solar drying. We participated in cooperative forest fire control with several northern Mexican states.

We served as a contractor for the A.I.D. in initiating a forestry development project in Honduras. Goals included strengthening the Honduran Forestry Corporation, demonstrating sustainable pine forest management on a model ranger district, and strengthening the Honduran forest industry. The Forest Service continued to work in close cooperation with A.I.D. and the USDA Office of International Cooperation and Development, primarily in developing countries, through the Forestry Support Program (FSP) and the Disaster Assistance Support Program (DASP).

Forestry Support Program

Through the Forestry Support Program, the Agency accomplished many projects in 1989. We underwent a formal end-of-project evaluation of the program's technical assistance to A.I.D. and the Peace Corps natural resources projects during the 9 years of the program's existence. We expect such an evaluation to result in an enhanced program for the 1990's.

We prepared a series of five papers on priority international development topics to guide future technical assistance in natural resources. We also prepared state-of-the-art documents on biotechnology, tree seeds, underused tropical species, biodiversity, and agroforestry. The program organized a tree seed technology training course for 23 participants from 11 English-speaking East African countries and began an inventory of A.I.D. projects addressing tropical forests and biological diversity.

The Forest Service worked around the world. We helped design an A.I.D. agroforestry project for Haiti, led a reforestation project evaluation in Burkina Faso, designed a forestry and soil conservation project in Tunisia, facilitated a Honduran environmental education workshop, evaluated the development potential of nonedible coconut products for a workshop in American Samoa, and analyzed Mexican environmental organizations. The Agency also relocated the market development component of the Forestry Private Enterprise Initiative (FPEI) from Ecuador to Guatemala and distributed 12 FPEI research publications.

Disaster Assistance Support Program

Through the Disaster Assistance Support Program, we arranged a 1-year detail for a Forest Service employee to A.I.D.'s Desert Locust Task Force in Washington, D.C. The Agency also provided technical specialists for locust control activities in Sudan, Senegal, The Gambia, Mauritania, and Algeria. Several Forest Service employees were recognized with USDA Distinguished Service Awards for this work.

The Forest Service served on the interagency steering group for the International Wildland Fire Conference in Boston, attended by 400 people from 39 countries. We provided advisors for a fire suppression training course in Costa Rica, an assessment of wildfire emergencies in Mexico, and hosted visits to U.S. fire suppression facilities for 11 Brazilians. A Forest Service geologist conducted a 2-week landslide hazard assessment workshop in Jamaica. We also produced a disaster operations management course and an instructor training course for participants from the Caribbean and Latin America.

Forest Service specialist assisted the Agency for International Development in controlling a desert locust plague in North Africa in the Sahel. Photo by Ron Libby

RESEARCH CHALLENGE COST-SHARE PROGRAM

In 1989, Research initiated a $500,000 Challenge Cost-Share Program, with funds to be matched on at least a 50-50 basis with non-Federal sources. The intent of the program was to expand Federal forestry research dollars in program areas benefiting our non-Federal client groups. A total of 17 proposals were funded: $200,000 to forest products and harvesting research, $178,000 to wildlife and fish habitat research, and $34,000 to recreation research. Another $81,000 went to other kinds of research, including biological diversity, multiresource management, and recovery of forest stands after natural disturbances. The remaining funds will be distributed in 1990.

More than 30 research partners are cooperating with Forest Service research scientists in these projects, and they are often contributing more than the 50-50 required share. Research results from these partnerships may become available in 2 years.

Natural grassland research area. F.S. Photo

RESEARCH NATURAL AREA PROGRAM

Since 1927, 210 research natural areas have been established on National Forest System lands (19 in 1989 alone) totalling 217,000 acres. Approximately 475 more candidate areas are being considered for addition to the Forest Service network.

Research Natural Areas represent unique ecosystems and exemplify pristine examples of important forest, shrubland, and grassland types. They also have alpine, aquatic, geologic, morphologic, and similar configurations in nature that have special characteristics of significant scientific interest. They have been reserved for nonmanipulative research, observation, study, and education. The network of research natural areas serves: (1) to preserve and protect genetic diversity and viability, and (2) as reference baseline areas for successional research and for measuring long-term ecological change or comparing the effects of manipulative research and resource management on National Forest System lands.

These areas are part of a national network of ecological sites for research, education, and the maintenance of biological diversity on National Forest System lands. The Forest Service, with cooperation from conservation organizations such as The Nature Conservancy, is working to complete the network. Including the 210 research natural areas on National Forest System lands, a total of 500 ecological sites have been established on lands held both in public and private ownerships.

Photo by Sam Frear

Resources Planning Act

From Vision to Action

Photo by Dave Reider

INTRODUCTION

The Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, as amended, directs the Secretary of Agriculture to periodically assess the status of the Nation's forest and range resources and to recommend a Forest Service program for their management and use. The Act requires the Agency to develop an Assessment every 10 years and a Recommended Program every 5 years.

The RPA Assessment describes the Nation's renewable resource situation and projects supplies of and demands for these resources. The 1979 RPA Assessment and its 1984 supplement were used in preparing the current 1985 RPA Recommended Program.

The 1985 RPA update is the third Recommended Program. It identifies a reasonable range of management directions, outputs, costs, and goals for the long-term future. It provides Congress and the public with comprehensive information for informed participation in decisions affecting our national forests.

To achieve long-term goals over the next 50 years, the 1985 RPA Program defined a course of action for Forest Service programs for the next 5 years. Each 5-year update provides for an update of policies and goals and incorporation of new information, such as costs, benefits, and available management technology. The RPA Program addresses National Forest System management and administration, forestry research, and assistance and leadership on private and State forest lands.

The 1989 RPA Assessment is currently being finalized and will be printed in early 1990. It includes a summary assessment, which provides resource conditions and a long-term outlook on the demand and supply of the land base, outdoor recreation and wilderness, wildlife and fish, timber, forest and range grazing, water, and minerals resource. The 1989 Assessment also has indepth separate technical assessments for each of the resource areas. A fact kit drawn from the Assessment lists key facts on the Nation's renewable resource situation and is now available. Summary findings of the Assessment are as follows:

- Demands for most renewable resources are projected to continue to increase. Although the rates vary among resources, the upward trend reflects the projected increase in population and economic activity.
- Supplies for most renewable resources are projected to increase.
- Although international trade is projected to expand moderately, most demands for natural resources will continue to be met from domestic supplies.
- The Nation has abundant opportunities to increase resource supplies through changes in resource management.
- Although some opportunities to expand supply are costly, others require relatively small investments.
- The opportunities to expand supply have direct implications for private management actions and public programs.

Information in the 1989 RPA Assessment provided an analytical base and long-term outlook for resource demand and supply for developing the Draft 1990 RPA Recommended Program. The design of the Recommended Program is based on three components: (1) roles for Forest Service programs, (2) consideration of contemporary issues, and (3) five long-term strategy options for the Forest Service programs.

A draft of the 1990 RPA Recommended Program, which will become the fourth Recommended Program, was released for public comment in the summer of 1989. Comments are being considered in the preparation of the final 1990 RPA Recommended Program, scheduled for release in the spring of 1990. It will contain the recommended long-term program strategy of the Secretary of Agriculture.

MAJOR FINDINGS OF THE 1979 ASSESSMENT AND SUPPLEMENT

The 1979 RPA Assessment and its 1984 supplement found that the demand for most products in the next five decades is likely to continue rising in response to a 34-percent increase in the Nation's population and a tripling of economic growth. The table below shows the projected percentage increase in total national demand for selected resource outputs.

	Percentage Increase from 1980	
	2000	2030
Timber	30	64
Range grazing	35	41
Downhill skiing	78	234
Hiking	17	59
Dispersed camping	33	105
Waterfowl hunting	33	69
Freshwater fishing	39	90

Resource supplies in the years ahead, based on a continuation of recent management trends, also would increase, but not as rapidly as demands at current price levels. As a result, demand and supply were expected to move to a new equilibrium position, with some associated impacts on the economy, society, and the environment, such as higher prices and increased use of wood substitutes and imports.

However, many of the effects were expected to be more than offset by the expected tripling of consumer-disposable income by 2030.

The RPA Assessment also pointed out that the expected increase in the price of consumer outputs is not inevitable. Expansion of private investments as well as public programs could reduce expected price increases.

THE 1985 RECOMMENDED PROGRAM

The RPA Recommended Program is presented as a range of outputs and activities, and its scope is discussed in terms of the High Bound and Low Bound of that range. The High Bound responds immediately to the 1979 RPA Assessment and RPA goals. The Low Bound response to long-term goals is confined to a constant level through 1990 to avoid adding to the Federal deficit.

The fundamental principle emphasized by the President's Statement of Policy in implementing the RPA Program is to strive for judicious balance between:

- The needs of this generation and the needs of future generations.
- The need for wilderness and the need for timber, forage, and minerals.
- The need to produce direct economic benefits and the need to provide for other benefits, such as outdoor recreation.
- The need to invest in national forests and the need to meet other demands on the Federal budget each year.
- The share of costs paid by general taxpayers and the share paid by specific users.

Major emphases of the 1985 RPA Program are as follows:

- Restoration and improvement of recreation facilities and trails.
- Significantly increased timber outputs from National Forest System lands.
- Improved, more cost-effective management techniques for national forests and other lands.
- New technologies to develop a higher rate of timber outputs while maintaining the environment.
- Improved coordination and mitigation for threatened and endangered species and completion of recovery schedules by the year 2000.
- Restoration of key habitat for salmon and steelhead trout.
- Shared responsibilities between users and Federal budget expenditures for bearing costs.
- Increased State and private share of support for State and private forestry.

PROGRAM GOALS FOR THE NATIONAL FOREST SYSTEM

	1986 Resource Output	2000 Resource Output	2000 Percent Change from 1986	2030 Resource Output	2030 Percent Change from 1986
LOW BOUND					
Minerals (thousand cases)	24	32	33	36	50
Recreation use (million visitor days)	215	260	21	340	58
Wilderness (million acres)	32	35	9	35	9
Range grazing (million AUM)	9.8	10	2	10.3	5
Timber offered (billion board feet)	11.4	11.8	4	15.6	37
Wildlife & fish (million user days)	23	23	0	28	22
HIGH BOUND					
Minerals (thousand cases)	24	36	50	38	58
Recreation use (million visitor days)	215	310	44	400	86
Wilderness (million acres)	32	38	19	40	25
Range grazing (million AUM)	9.8	10.3	5	11.3	15
Timber offered (billion board feet)	11.4	14	23	20	75
Wildlife & fish (million user days)	23	35	52	40	74

National Forest System

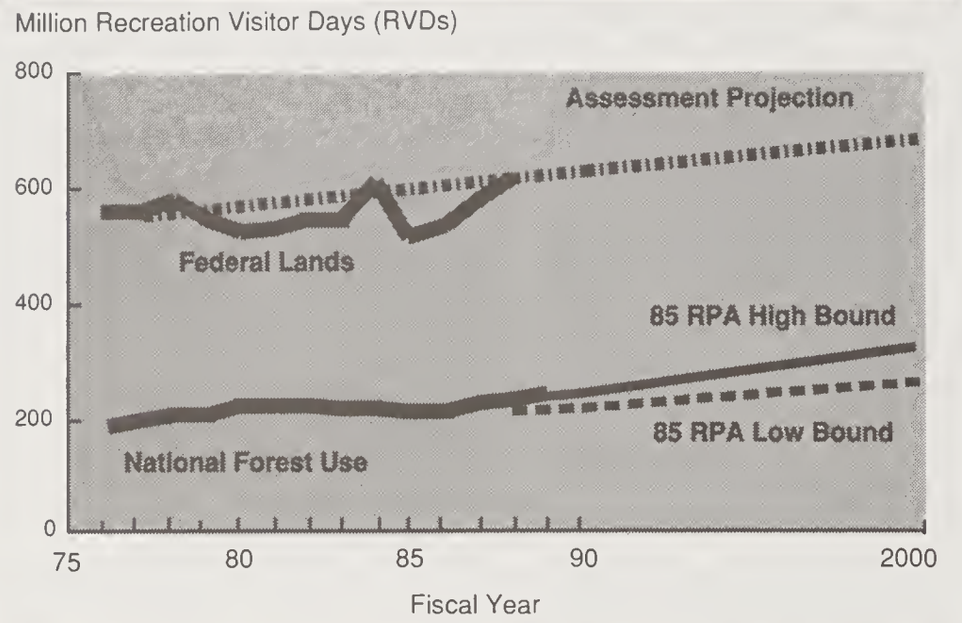
The Forest Service used the most up-to-date information available from forest planning to develop the 1985 resource output response to national long-term goals for the National Forest System. The following table shows long-term program goals (years 2000 and 2030) for the National Forest System at both bounds, as compared to 1986—the first year of the current RPA Program.

Minerals. The workload in the minerals program is expected to grow rapidly in response to minerals demands during the first 5 years of the 1985 RPA Program. Processing permit applications will grow more slowly at the Low Bound, postponing some of the potential growth in economic benefits. At the High Bound, resource outputs are 50 percent higher by the year 2000, with accompanying higher benefits.

Recreation. To meet future goals in the recreation program, the early years of the 1985 RPA Program capitalize on other resource management activities and volunteer programs to help meet increasing demands in a cost-effective manner. Emphasis is placed on improving and maintaining existing facilities and trails.

The recreational use graph for Federal lands indicates that approximately 40 percent of such recreation use occurs on national forest lands. The High Bound of the RPA Program maintains this share of the 1979 RPA Assessment projection of future use; at the Low Bound, the national forests would be expected to provide about a 7-percent lower share of the total, or 33 percent of total Federal recreation visitor-day use.

Recreation Use

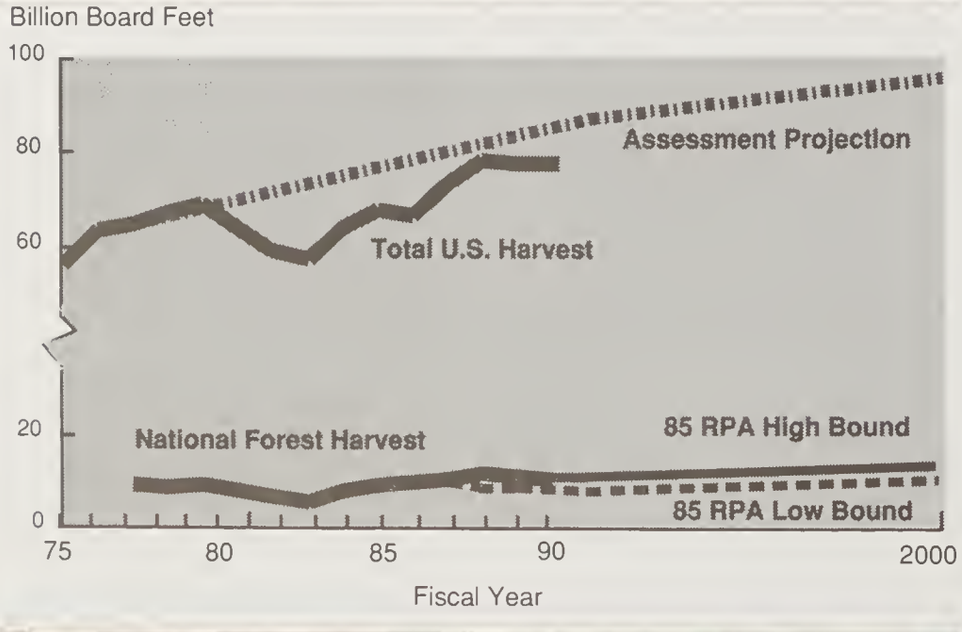


The Program projects a 9- to 25-percent increase in wilderness acreage by the year 2000. The primary activities to protect wilderness values are improving the trail system and administering and managing all wilderness uses.

Range Forage. Range management emphasizes improving and maintaining resource productivity. This includes maintaining domestic livestock grazing at current levels through the year 2000 while improving conditions for wildlife, watershed, and recreation use. Grazing on National Forest System lands is a small portion of the grazing use in the Nation; however, much of the national forest use is seasonal and complements operations on adjacent private lands. Permitted use on National Forest System lands in 1989 was 9.9 million animal unit months—slightly higher than the High Bound and Low Bound recommendations.

Timber. Despite higher timber goals in the future, timber harvest increases only slightly through 1990 at the High Bound and declines by approximately 20 percent at the Low Bound. Timber harvest increases at both Bounds after 1990. To meet long-term goals, the 1985 RPA Program relies on new technology to provide additional economic opportunities and cost reduction to raise the efficiency of the program. The higher timber output, with other rising outputs, is expected to contribute to community growth.

Timber Demand and Harvest Levels



Reforestation and timber stand improvements increase in early years to support harvest levels at the High Bound. These activities hold constant through 1990 at the Low Bound, deferring needed timber stand improvement until after that time.

The timber demand and harvest graph compares U.S. and national forest totals, as well as RPA Assessment projections. During the early 1980's, RPA Assessment projections were high with respect to actual national harvests. Timber harvest from national forests increases at both Bounds by the year 2000. The national forest harvest was 11.8 billion board feet, 15 percent of the U.S. total

harvest, in 1989. At the High Bound in the year 2000, national forest harvest is 14 percent of the projected U.S. total; at the Low Bound, it is 11.8 percent.

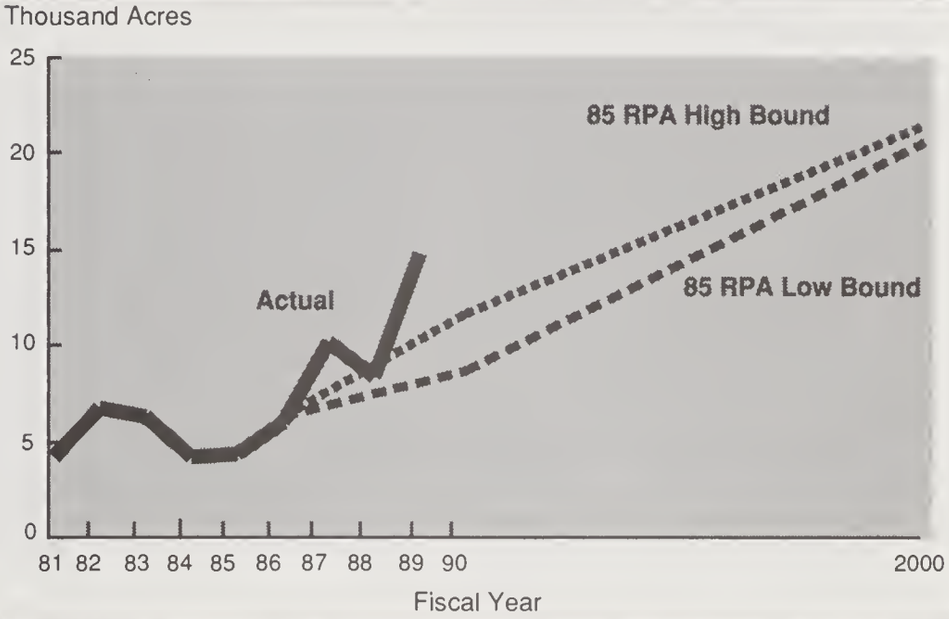
Water Resources. The 1985 RPA Program maintains or enhances long-term water supplies and water quality on the national forests. Emphasis is on improving watershed condition and maintaining sensitive riparian areas. The watershed improvement graph shows levels of accomplishment associated with increased investments in the RPA Program. Watershed improvement accomplishments with appropriated funds in 1989 was 15,057 acres. This increase in accomplishment is from increased appropriated funding, the availability of excess timber receipts in 1989, and watershed improvement work associated with fire recovery in the Pacific Southwest and Pacific Northwest regions.

Wildlife and Fish. The 1985 RPA Program provides for balanced attention to all wildlife and fish habitats to meet long-term goals. The High Bound includes special emphasis to improve habitat for threatened and endangered species and salmon and steelhead by the year 2000.

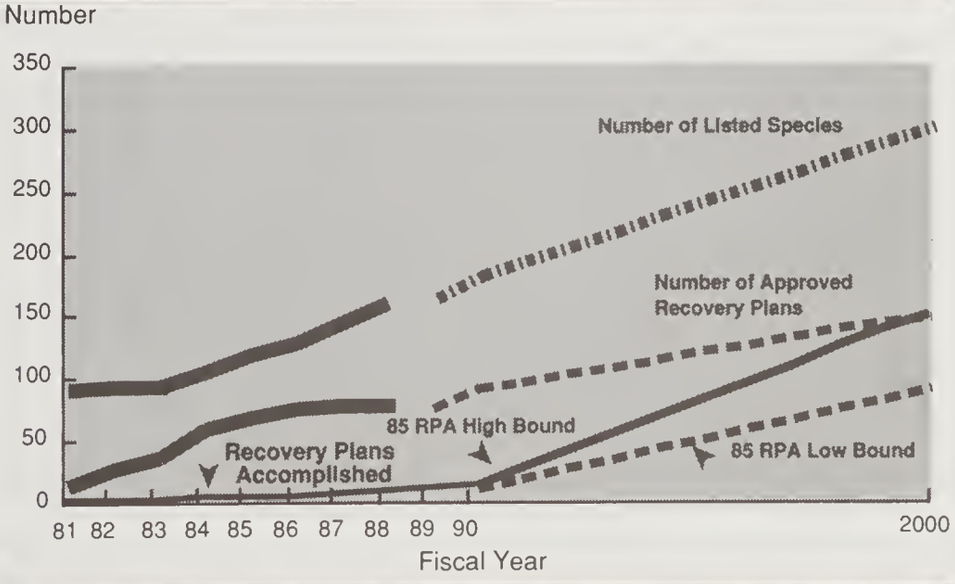
National Forest System lands continue to be essential for maintaining the threatened and endangered species in the United States. By the year 2000, the High Bound achieves 100 percent of Forest Service recovery tasks identified in fish and wildlife approved plans; the Low Bound achieves 65 percent of those tasks. The Forest Service will need increased emphasis to close the gaps among the number of species being listed, plans being prepared, and accomplishment of our share of recovery tasks in those plans.

The annual harvest of salmon and steelhead spawned and reared in national forests has averaged approximately 118 million pounds during the 1980's. The 12 million pound increase is a record catch by fishermen. It is the result of investments made through cooperative programs in habitat enhancements over the past several years on National Forest Systems lands. The High Bound increases

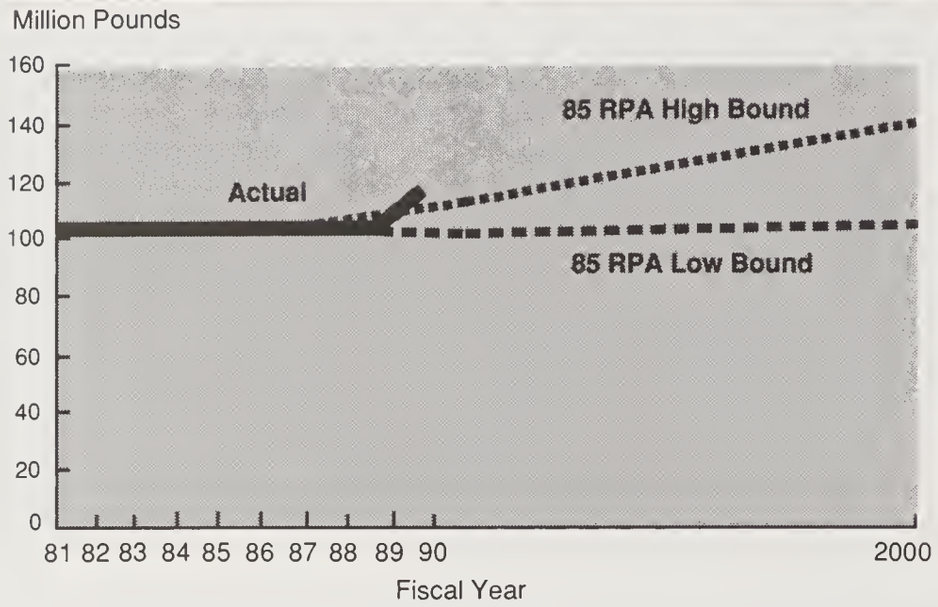
Soil and Water Resource Improvement (Appropriated Funds Only)



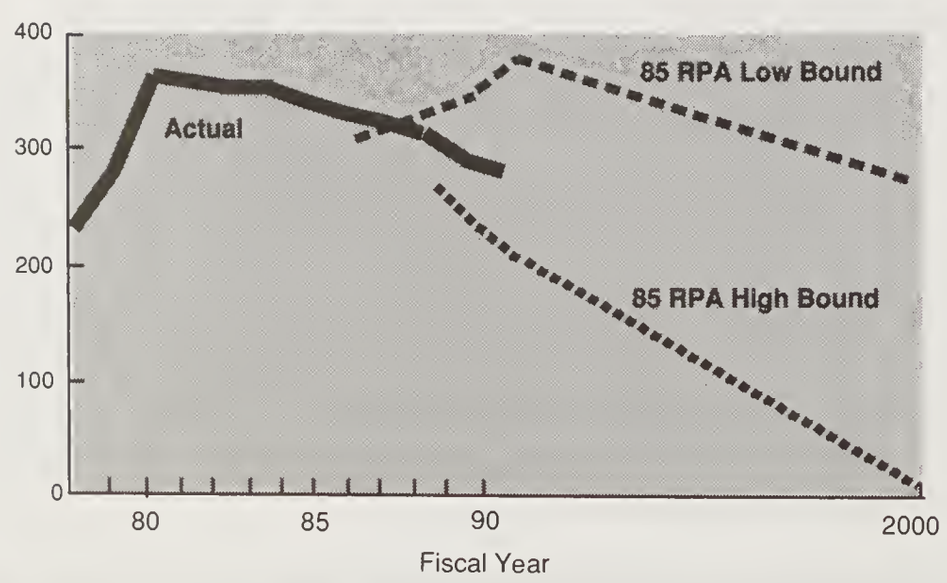
Listing and Recovery for Threatened & Endangered Species on National Forest System Lands



Salmon & Steelhead Commercial Harvest (Reared and Spawned on National Forests)



Recreation Facilities Deferred Maintenance Constant 1989 Dollars



harvest by 33 percent in the year 2000; the Low Bound does not increase harvest until after the year 2000.

Deferred Work. Recreational use on national forests declined from 1981 through 1989, although recent use has returned to the early 1980's level. Approximately 60 percent of recreational use on national forests is for unstructured dispersed recreation; the remaining 40 percent is at developed facilities. During the 1980's, the operating capacity for these facilities on national forests has declined to the current level of 130.6 million PAOT days (PAOT is the capacity in people at one time). The decline in use in part reflects this lower capacity and a public desire for facilities at a higher level of development.

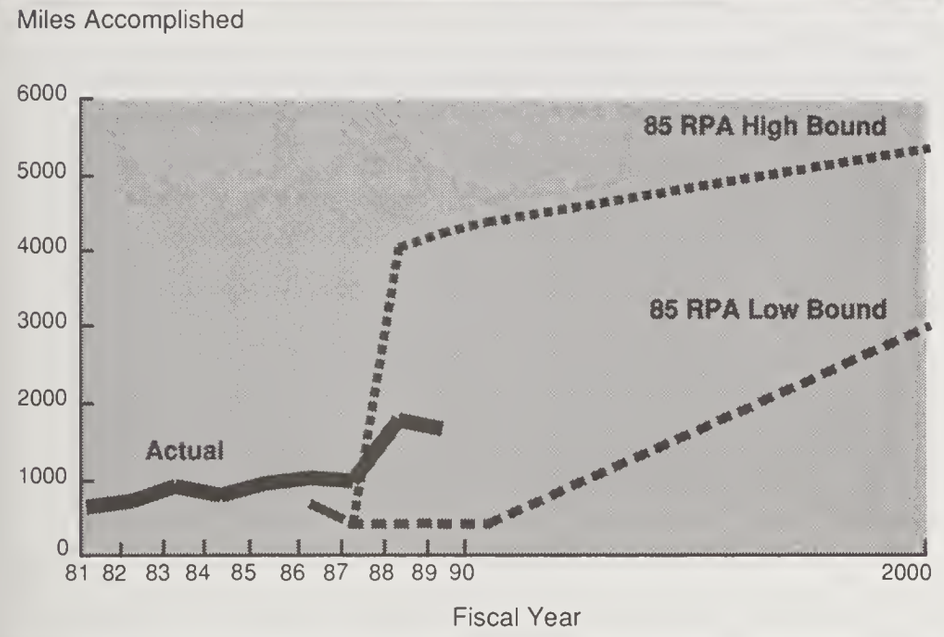
Nevertheless, the amount of deferred recreation facility maintenance has been gradually reduced in recent years. The High Bound eliminates deferred work in these areas by the year 2000. At the Low Bound, deferred needs increase through 1990. After 1990, the Low Bound also reduces the inventory of deferred needs to prevent further resource and facility deterioration.

State and Private Forestry

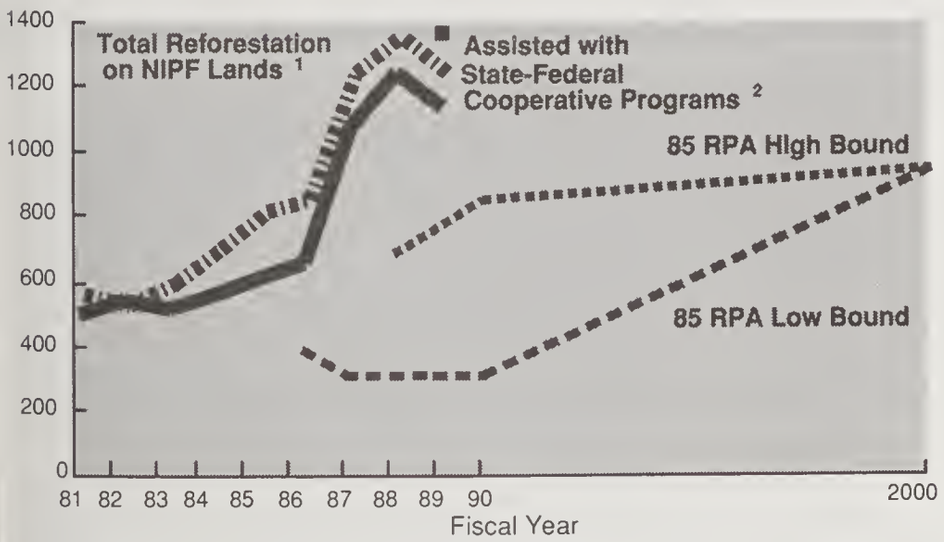
The objective of State and Private Forestry is to increase the productivity of nonindustrial private forest lands to meet projected resource demands at a reasonable price. Of the Nation's commercial forest land, 57 percent is owned by nonindustrial private forest landowners. These lands currently support 46 percent of the Nation's softwood and hardwood growing stock and 38 percent of the Nation's sawtimber inventory. Because there is relatively little forest management on approximately two-thirds of these lands, they offer the greatest opportunity for increasing timber supplies in the United States. These opportunities are located largely on 10 percent of the ownerships with more than 100 acres of land.

The 1985 RPA Program relies on the States and the private sector to provide an increasing share of the cost over

Trail Miles Constructed/Reconstructed RPA and Actual Accomplishments



Total Reforestation on Nonindustrial Private Forest (NIPF) Lands



1 Total reforestation on NIPF lands includes acreage from state incentives programs, landowner assistance by industry, consultants, and unassisted owners in addition to acreage assisted with State-Federal cooperative (S&PF) programs. Accomplishment shown for FY 1988 and FY 1989 includes Conservation Reserve planting.

2 The portion of reforestation assisted by State-Federal cooperative programs - FIP and ACP (ASCS programs jointly administered by the Forest Service) and Conservation Reserve (administered by ASCS with Forest Service and Soil Conservation Service assistance) which cost -share planting with landowners and non-cost share planting, i.e., provide technical assistance only.

time at both the High Bound and Low Bound. Expected outputs are the same at both Bounds after the year 2000, but the Federal assistance is different. Both Bounds would require the States to decide whether to replace Federal financial assistance with State-level assistance. The High Bound of the Program assumes that States will gradually replace Federal financial assistance and that this will be accomplished by 2000. At the Low Bound, Federal financial assistance discontinues after 1986.

Tree planting on nonindustrial private lands during 1989 declined slightly from 1988 peak levels. Approximately 38 percent of the trees planted in 1989 (1.3 million acres) were on nonindustrial private forest lands, primarily in the South.

The State and Private Forestry reforestation programs described in the 1985 RPA Program provide assistance in reforestation on nonindustrial private forest lands. In 1982, State-Federal cooperative programs, which include both State and Federal costs, assisted in almost all the 548,000 acres of reforestation on nonindustrial private forest lands; in 1986, they reforested 667,000 acres, or 75 percent of the total.

The graph shows this accomplishment as compared to the RPA Program. The increase from 1981 through 1986 occurred with stable funding of the Forestry Incentives Program and the Agricultural Conservation Program, which provide cost-share assistance to landowners. The increase also reflects a trend of the States and landowners to provide an increasing share of the cost. Although the 1985 RPA program includes reforestation under these two programs, they are funded through the Agricultural Stabilization and Conservation Service, and their costs are not included in the State and Private Forestry costs.

The primary reason for the sharp increase in planting since 1986 was the Conservation Reserve Program, established as part of the Food Security Act of 1985. Congress established a goal of 5 million acres for tree planting by 1990 under this program. This will result in a short-term

increase in acres planted, similar to the Soil Bank Program in the late 1950's. After 1990, tree planting accomplishments are expected to drop back to the pre-1987 trend. Including Conservation Reserve Program planting, State-Federal cooperative programs accounted for approximately 80 percent of total reforestation on nonindustrial private lands in 1989.

Research

The research goal is to improve long-term productivity on public and private lands and to provide basic technology to cope with emerging problems. A primary focus of the 1985 RPA Program for Research is to support cost-efficient management of National Forest System lands. The ability to meet planned output levels is directly related to early investments in research.

The Research program has two major components: (1) the base level and (2) additional research initiatives. A substantial portion of the base program is aimed at sustaining technological effectiveness. Other research in the base program is classified as enhancing research—research to increase technological capability and effectiveness.

To satisfy the additional needs of the Forest Service and other Federal, State, and private sector users of Forest Service Research, we need a program above 1986 funding levels for high-priority initiatives in such areas as biotechnology and acid deposition. The most distinct differences between the High Bound and Low Bound are the rates of implementation of currently identified initiatives and some reordering of priorities among initiatives. At the High Bound, research on most of the initiatives is under way by the year 2000; at the Low Bound, this level of research is not reached until 2030.

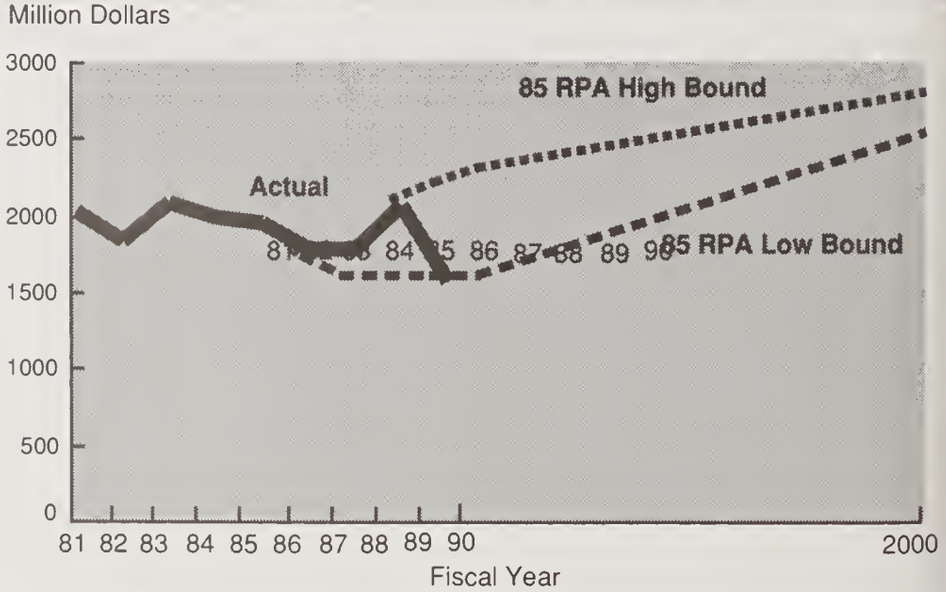
In 1989, the Research budget was 138.2 million dollars—above the High Bound recommended level. Research emphasis now being placed on forest atmospheric interaction (acid deposition), wildland urban interface, and threatened and endangered species is greater than was anticipated in the 1985 RPA Recommended Program.

Total Program

The accompanying graphs show the actual Forest Service RPA Program for 1981 through 1989 for National Forest System management and administration, State and Private Forestry assistance and leadership, and Research. The graphs also show through the year 2000 how the 1985 RPA Program moves toward the long-term outputs and goals.

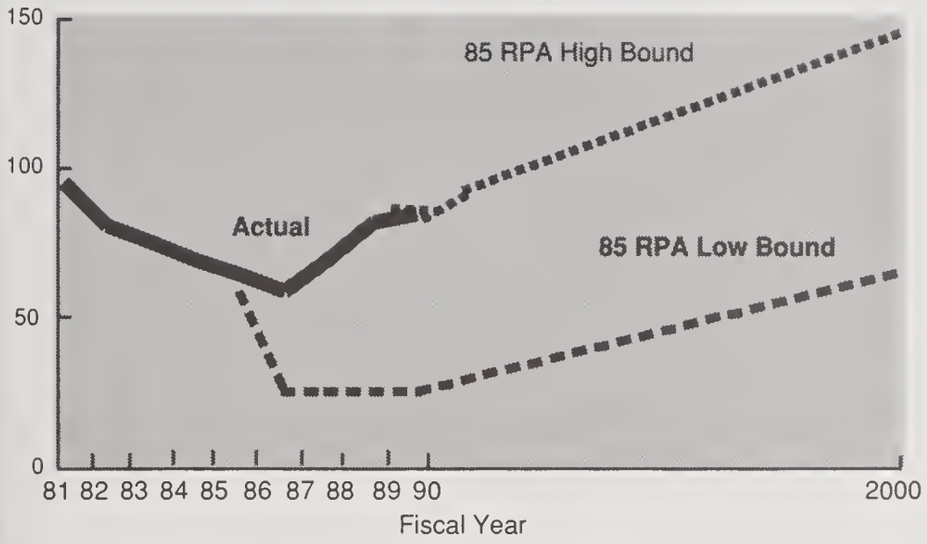
RPA Program

National Forest System
Constant 1989 Dollars



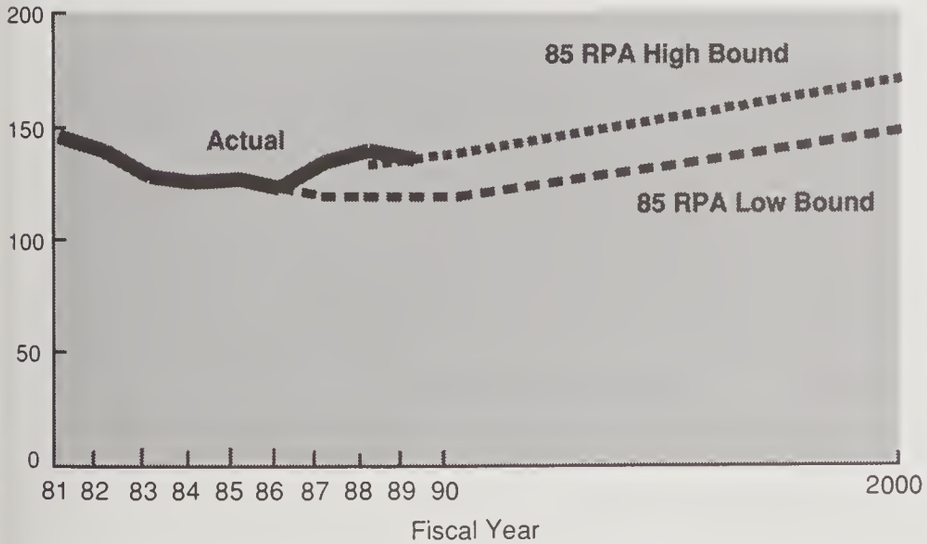
The 1985 RPA Program is the same as the actual Forest Service budget in 1986 and is the same as the President's budget proposal for 1987. Beginning in 1988, the Program is expressed as High and Low Bounds of a range.

State and Private Forestry
1989 Dollars



The 1985 RPA Program is the same as the actual Forest Service budget in 1986 and is the same as the President's budget proposal for 1987. Beginning in 1988, the Program is expressed as High and Low Bounds of a range.

Research
1989 Dollars



The 1985 RPA Program is the same as the actual Forest Service budget in 1986 and is the same as the President's budget proposal for 1987. Beginning in 1988, the Program is expressed as High and Low Bounds of a range.

Photo by Don Virgovic

ADMINISTRATION

STRENGTH THROUGH DIVERSITY

Photo by Yuen-Gi Yee

INTRODUCTION

Administration is responsible for managing the Forest Service's organizational resources in the most efficient and effective manner to achieve the Agency's mission. As budgeted resources continued to be more limited and as land management issues became more complex, 1989 Administration efforts focused on further improving Agency productivity, better managing the human, capital, and information resources, and maintaining communication with and the involvement of the American public in forest management.

IMPROVING AGENCY PRODUCTIVITY

Management Improvement

Pilot Study. The Forest Service has tried all the traditional ways to cut costs and improve productivity, but failed to completely motivate personnel to seek higher levels of productivity on their own. In 1985, the Forest Service initiated a National pilot study that involved three national forests and a research station in testing a less stringent control structure that encouraged innovation and creativity. The units were granted:

- Flexibility within basic policy and legal bounds to achieve agreed-on output targets and objectives, including waivers from certain requirements.
- Budgets allocated by appropriation rather than numerous line items.
- A process whereby ideas for productive change are generated from the bottom of the organization upward and are approved if legal and worth testing.
- Freedom to apply savings to other high-priority work.

Because of the pilot study's success in 1986, we expanded it in 1987 to include an entire Region and another research station. In addition, some Regional Foresters initiated "pilot type" efforts within their units. In early 1988, the pilot study was expanded again to include the Washington Office of the Forest Service.

By 1989, most of people involved in the pilot study agreed that a free structure that encourages creativity and innovation does improve productivity. The Chief concurred and stated that the pilot philosophy of "empowering employees and loosening up the system" is now the management philosophy of the Agency. Therefore, this management philosophy shifted from being a test to being effectively implemented Service-wide.

The Forest Service is still learning about how to motivate workers and increase productivity in a Federal Government setting. New ideas are evolving to challenge traditional approaches to structuring and operating Government organizations. We are developing a series of provocative papers, titled "New Thinking for Managing in Government," to document the pilot test experience and share the results with other Government agencies.

People Data Base Project. The Agency initiated a people data base project to improve the efficiency of information processing, better integrate systems, and reduce costs. This project will develop a stable, logically oriented foundation of data on the work force and will be the basis for personnel systems, the fire qualification system, and certifications systems, such as silviculture and mineral examiners.

Currently, the project is used to determine the various types of information needed by managers and other officials and how the information is related. Most applications should be developed by 1991.

USDA Demonstration Project. The Department of Agriculture has developed a personnel demonstration project that will evaluate alternative procedures for recruitment and selection. The Forest Service and the Agricultural Research Service will participate in this project, which should reduce paperwork and improve the ability to acquire a quality work force that reflects a culturally diverse society. The project plan was published in the Federal Register to solicit public comment, and implementation is planned for June 1, 1990.

New Approach to Temporary Employment. After a 2-year test period, the Forest Service implemented new procedures Service-wide for hiring temporary employees. In cooperation with the Department of Labor and the State governments, State employment offices are referring candidates for seasonal temporary positions to appropriate Forest Service officials. This has improved the quality of candidates, the timeliness of filling vacancies, and the Agency's relationship with State offices.

Master Labor Agreement. The Forest Service renegotiated a national agreement with the National Federation of Federal Employees, which represents approximately 15,000 Forest Service employees. This master agreement is more consistent and efficient than allowing each local unit to negotiate its own agreement. Both management and the union are comfortable that this contract will lead to a good working relationship for the next 3 years.

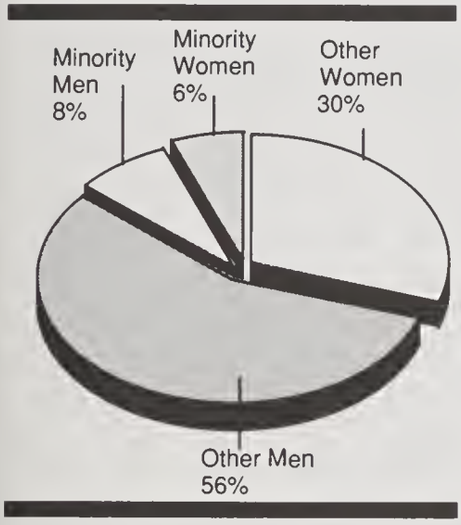
Equal Employment Opportunity Counselor/Mediator Program. The Agency implemented a professional EEO Counselor/Mediator Program, which uses full-time professionals and reduces the number of collateral duty EEO counselors. Making this a professional program should reduce costs, increase informal complaint resolutions, improve the quality of decisions, and enhance productivity.

MANAGING THE HUMAN RESOURCE

Workforce Population

The Forest Service had 30,470 permanent full-time employees in 1989 and a total of 46,994 employees by the end of the year (including temporary, emergency, excepted, and so forth). This is a 5-percent increase over 1988. Increased emphasis in recreation, wildlife, and fisheries is responsible for much of this increase.

1989 Permanent Workforce Composition



In its effort to ensure multiple-use management, the Forest Service has reduced the number of foresters and civil engineers by more than 800 positions since 1980. At the same time, however, the following occupational work force positions have increased by a similar amount: outdoor recreation planner, general biological scientist, biological technician, ecologist, botanist, fisheries biologist, and wildlife biologist. The Agency also has increased the number of trainees in preparation for a projected increase in retirements.

Most of our employees are in the field; only 1.7 percent of the work force is in the Washington, D.C., area. The agency is increasing its proportion of professional employees, but more than 50 percent of the workforce are technicians.

Diversity

Population Distribution. The Forest Service continues to increase the number of women and minorities within its work force. Women represent 36 percent and minorities 14 percent of the permanent work force; these are 2 and 1 percent higher than 1988, respectively. The gains in women and minorities have been in all types of occupations—professional, administrative, and technical.

Historically Black Colleges and Universities Program. The Chief continued to chair the USDA/1890 Task Force and implemented several of the task force's recommendations. The Forest Service employed 76 students from 1890 Land Grant Colleges and Universities this summer and filled liaison positions at four of these institutions. With the Historically Black Colleges and Universities Comprehensive Program, the Agency expanded or established new working relationships with several historically black colleges and universities.

Native American Indian Program. The Forest Service established a Tribal Government Program to complement the Native American Employment Program, and to advocate improved communications and partnerships with Native American and Alaska Native communities. The agency also developed policy to address the unique obligation the Federal Government has with Indian Tribal Governments and Alaskan Natives. This policy should heighten sensitivity with all employees and establish mutual partnerships with these communities.

We also developed an agreement with Haskel Indian Junior College to provide students with better work experiences, improved career counseling, and specific academic training related to the agency needs. This program includes high school recruitment, student counseling, summer work experiences, outplacement into baccalaureate programs, cooperative education, a Forest Service liaison-instructor, and placement into a permanent position upon graduation. The program should better prepare the students for productive careers.

In 1988, Workforce 1995 was initiated to achieve a more diversified workforce by concentrating on five areas: recruitment, retention, upward movement, organizational culture, and public awareness along with internal understanding. In 1989, Service-wide efforts were made through seminars, conferences, and the like to increase awareness and develop strategy for a culturally diverse agency.

Special Programs

The Forest Service's Human Resource Programs provide job opportunities and training for youths, the unemployed, underemployed, economically disadvantaged, and elderly while carrying out high-priority conservation work. The Job Corps, Senior Community Service Employment Program, Youth Conservation Corps, Volunteers in the National Forests, and Hosted Programs offered employment and skills training to 95,608 persons during 1989, including many women and minorities. For an investment of $82.6 million, a value of $98.6 million in accomplishments was returned from all programs (Table 66). Participants built campgrounds and trails, planted trees, built fences, fought fires, improved timber stands, constructed office buildings, warehouses, and roads, and provided clerical support.

Job Corps. Under an interagency agreement with the Department of Labor, the Forest Service continues to operate 18 Job Corps Civilian Conservation Centers on 15 national forests in 11 States. The focus remains on improving the enrollees' opportunities for productive work through training in vocational skills, basic educa-

Corpsman learns woodworking skills at the Anaconda Job Corps Center. F.S. Photo

tion, and social development.

More than 93 percent of the graduates were either placed in jobs, entered college or advance training courses, returned to school, or joined the military. The 18 Centers served more than 8,499 students between the ages of 16 and 22 and accomplished $17.9 million in improvements, including firefighting, community work, building construction, and forestry activities. Progress was made toward:

- Developing a data base for enrollee records.
- Upgrading educational programs through an ongoing agreement with the Howard County school district.
- Linking with other training programs such as the Job Training Partnership Act, schools, colleges, private industry, and other organizations, to strengthen training and services for students.
- Upgrading our vocational and social skills, counseling, and education programs.

A Senior Citizen enrollee provides direction to a customer. F.S. Photo

In 1989, the Job Corps program celebrated its 25th anniversary. The kickoff started in April with "A Silver Salute to the Friends of Job Corps. " The grand finale was in September with the "Festival on the Mall" in Washington, D.C. The Job Corps is the world's oldest and largest residential education and training program for youth. The program has served more than 1.4 million youths in its 106 Job Corps centers located in nearly every State. After 25 years, the Job Corps program is stronger than ever and offers youth a "chance for change."

Furthermore, the Job Corps program continued to increase its number of women students. Currently, the Forest Service has nine coeducational Job Corps Centers. The Wolf Creek Center in Oregon is scheduled to become coeducational in early 1990, and all other centers should become coeducational within the next several years.

A member of the Senior Citizens Program provides entertainment for a young visitor on the Pisgah National Forest. F.S. Photo

YCC crew at the Hayden District construct picnic tables at Lakeview Campground on the Medicine Bow National Forest. Photo by Ed Fox

Volunteers from "Trout Unlimited" build gabions to stabilize the stream bank on Spring Creek on the Mark Twain National Forest, Rolla Ranger District. Photo by Charles Gill

The Department of Labor approved the opening of six new Job Corps sites. Mt. Laguana on the Cleveland National Forest in California was selected as one of the new sites and is scheduled to open in about 3 years.

Senior Community Service Employment Program. Authorized under the Older Americans Act, the Senior Community Service Employment Program provides part-time community service employment for low-income persons who are 55 or older. The program also provides training opportunities to upgrade present skills and introduce new skills. The Forest Service successfully placed 19 percent of its participants in jobs outside the Agency during program year 1988-89.

The Department of Labor funds the Forest Service through an interagency agreement. In the 1988-89 program year, 6,148 persons participated and accomplished $34.7 million worth of conservation work. For each appropriated dollar, $1.56 was returned in work value accomplishment.

Youth Conservation Corps. Youth Conservation Corps is a summer program for 8 weeks, 40 hours a week. The Forest Service randomly selects enrollees in the Youth Conservation Corps from applications submitted by 15- through 18-year olds representing all strata of society. The youths earn and learn while performing conservation work on National Forest System land. This is a summer employment program for 8 weeks, 40 hours per week. The enrollees are paid from Forest Service funds and accomplish many different tasks. In 1989, the 1,276 enrollees' work returned $1.09 for each dollar invested.

Volunteers in the National Forests. This program offers individuals the opportunity to donate their talents and services to help manage the Nation's natural resources. The program continues to grow in popularity as people realize how they can personally help with natural resource programs. This year, 67,356 volunteers helped the Forest Service manage National Forest Systems lands and contributed 2,225 person-years of work valued

A volunteer paints a new sign for the Pawnee National Grasslands. Photo by Ed Fox

at $29 million.

Our Agency continued to maintain a cooperative agreement with North Carolina Agricultural and Technical State University to increase the number of minorities and women who participate in the volunteers program and who pursue careers in natural resources. The university has developed a dual-degree program in forestry and a course in volunteer management. The number of minority freshmen entering the natural resource curriculums at the university increased significantly.

The Touch America Project (TAP) is a special volunteer program that gives youth between the age of 14 to 17 a chance to gain job experience and environmental awareness while working on public lands. In 1989, private sector organizations sponsored 5,303 youths in TAP.

Hosted Programs. The Forest Service provides conservation work opportunities for participants in programs administered primarily by State and local governments. Through the use of Hosted Programs, the Forest Service helps alleviate social problems by providing work sites for participants who are funded through State health and welfare agencies, the Job Training Partnership Act, State block grants, vocation rehabilitation, college work study, and others. In 1989, the 12,329 Hosted participants contributed 1,129 person-years of work valued at $14.6 million. In addition, these programs provide a pool of potential employees who may contribute to the diversity of our work force. These programs vary, but they usually require the Forest Service to provide work experience and training. At the same time, this gives many people the opportunity to become aware of and contribute to caring for natural resources and the environment.

Many workers perform natural resource work at little or no direct cost to the Forest Service through agency agreements with State and county agencies, colleges, universities, Indian tribes, and private and nonprofit organizations with multiple objectives, such as handicapped rehabilitation, and advocacy for elderly or at-risk youths.

The Agency, in partnership with the Department of Justice's Bureau of Prisons, continued to explore the possibility of using existing facilities for housing minimum security inmates in having them perform natural resource work on national forest system lands, thus helping to assist in alleviating prison overcrowding.

TAP enrollees restoring the West Fork Cabin project at Bonners Ferry on the Panhandle National Forest. Photo by Ed Fox

MANAGING THE CAPITAL RESOURCE

All-Resources Reporting

During 1989, six case study national forests, working cooperatively with the General Accounting Office, developed an all-resources reporting concept. The concept is being tested on eight national forests in 1990. Full implementation is scheduled to begin in 1992. Because of congressional interest in attaining better cost data on the management of national forest multiple-use programs, the House Appropriations Subcommittee suggested in the 1988 and 1989 Congressional Reports that the Forest Service consider extending the Timber Sale ProgramInformation Reporting System (TSPIRS) concepts to all multiple-use programs. In the 1990 Congressional Report, we were urged to continue expeditiously to develop the All-Resources Reporting System.

The all-resources reporting concept includes three types of information statements—financial statements, results of management (outputs and activities) statements, and socioeconomic (jobs and income) statements—that summarize national forest programs and include key components of multiple-use resources. The statements show revenues, costs, benefits, outputs, activities, and the effect on the socioeconomic environment that the forest influences. The concept includes Regional and national summaries.

End-Results Budgeting

In 1988, the House Appropriations Subcommittee requested that we continue the "identification of useful program output targets, and relating these targets to those in the land management plans" before any further implementation of the budget reform measures within our end-results budgeting proposal. They also requested that the Agency cooperate with the General Accounting Office to develop an accounting system similar to TSPIRS for all resources. This system is to be designed to support the outputs included within end-results budgeting. The Forest Service agreed with the House Subcommittee not to seek further congressional approval of any additional phases of the end-results budgeting proposal until we have completed our joint examination of all-resources reporting. As part of that process, we have identified a set of target measures that are being reviewed and tested by several national forests during 1990.

Receipts and Expenditures

Although the Forest Service receives its operating funds from Congress and various cooperator deposits, it also produces revenues. In 1989, we produced 58 cents of revenue for every dollar expended. Our 1989 receipts totaled $1.84 billion, up 13 percent from 1988, while expenditures totaled $3.19 billion, up 18 percent from last year.

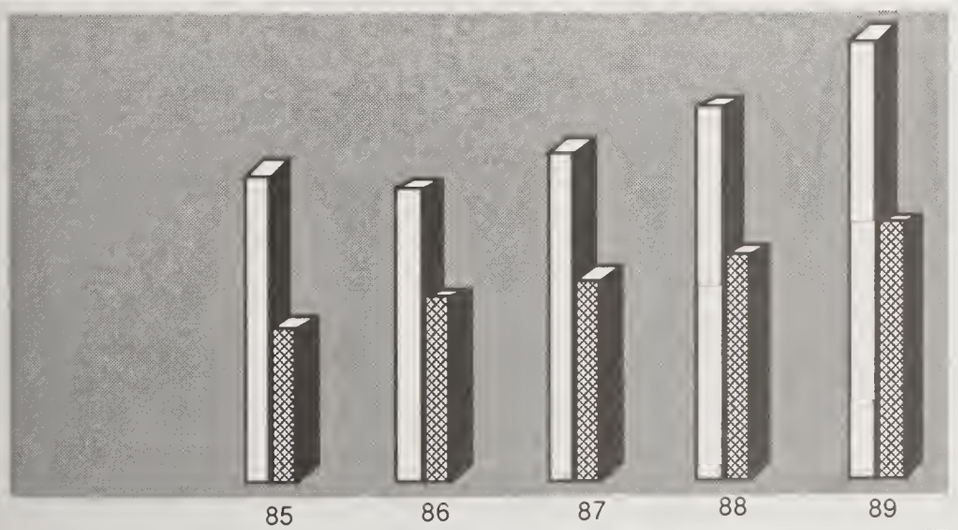
We collect receipts primarily from timber sales, mineral leases and permits, grazing permits, and recreation uses. Timber receipts in the form of cash, deposits, and roads in lieu of cash totaled $1.44 billion, or 79 percent of the total revenue in 1989. Receipts from mineral leases, royalties, sales, and bonus bids made up the second-largest revenue source with $266 million or, 14 percent of the total.

By law, the Forest Service pays the States 25 percent of all national forest receipts. These payments are used for public schools and roads in the counties that have National Forest System lands. We paid $353.8 million to the States in fiscal year 1989and $7 million to counties from National Grassland and Land Utilization Project receipts. Minnesota received $1.1 million under the Boundary Water Canoe Area Wilderness Act. Table 58 lists additional Forest Service receipt and expenditure data for 1989.

Procurement and Property

The Forest Service continues to increase the efficiency and effectiveness of the procurement program through which we accomplish much of our land management work and service to the public. The Agency spent approximately 26 cents of each budgeted dollar through contracting or small purchases transactions. Eighty percent of total procurement dollars went to small businesses. Contract awards included more than $25 million to disad-

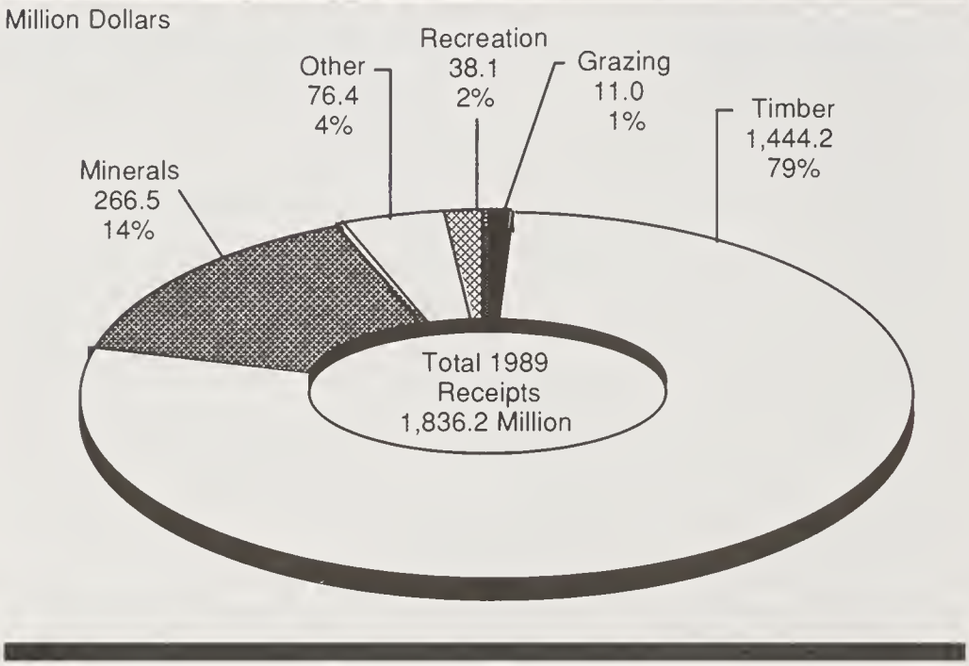
Expenditures and Receipts



(Million Dollars)

	85	86	87	88	89
Expenditures	2,199	2,078	2,351	2,693	3,191
Receipts	1,133	1,321	1,458	1,618	1,836
Receipts as Percent of Expenditures	51.5%	63.5%	62.0%	60.0%	57.5%

Distribution of Receipts by Program



vantaged businesses and $24 million to women-owned firms.

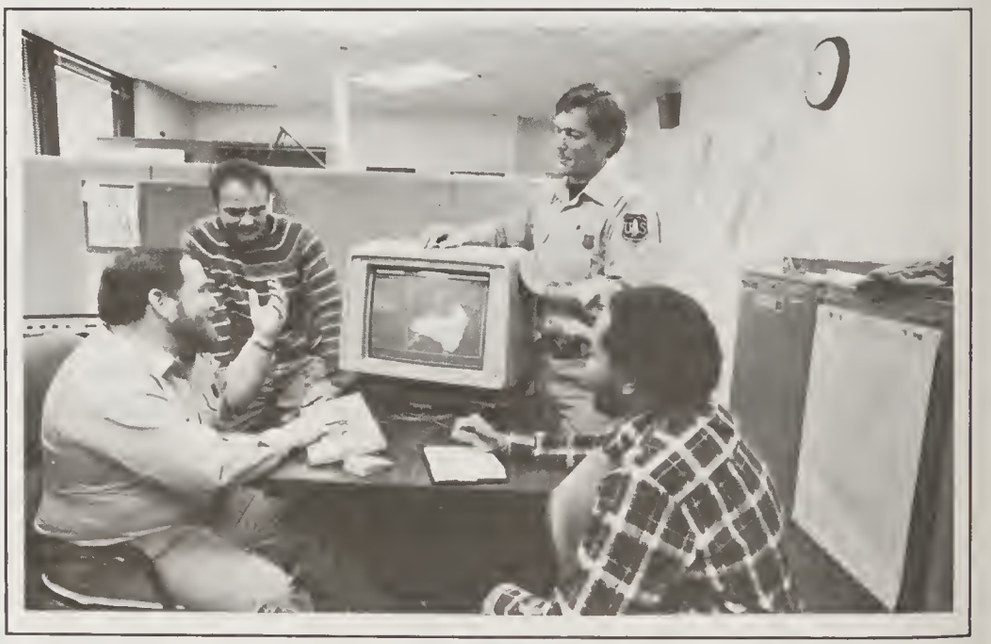
Accomplishments in 1989 included the following:

- A high level of administrative support for forest fire suppression and rehabilitation activity during the field season.
- Participation in an agency-wide initiative to simplify business management procedures used in support of fire and other emergency activities.
- Completion of work on the Department of Commerce-sponsored pilot test of the small purchase credit card in preparing for agency-wide implementation in 1990 of the new General Services Administration program.
- Participation in a test of alternative disputes resolution procedures designed by the Administrative Conference of the United States to simplify the contract claims and appeals process outside the formal Board of Contract Appeals milieu.
- Work with the USDA Office of Operations, the General Services Administration, the Federal Acquisition Regulations Council, the Office of Federal Procurement Policy, and other Federal agencies on new legislation affecting Federal procurement.

We implemented complex new regulations governing the drug-free workplace, the procurement of architectural and engineering services, the small business set-aside program, and the integrity of the procurement process.

The Forest Service established processes aimed at simplifying agreement formation while maintaining only indispensable fiscal controls for our grants and cooperative agreements program. Administration supported the Agency's Partnership Initiative by clarifying the partnership concept and corresponding instruments and authorities used to accomplish them, securing appropriations act language that allows us to enter into noncompetitive Challenge Cost-Share arrangements when the cooperator performs the work, and submitting a legislative proposal to transfer the challenge cost-share language from the current appropriations act to a permanent statute. The Procurement and Property Staff now manages the entire range of grants, agreements, and procurements and successfully performs transactions with other agencies and the private sector.

Forest Service personnel managed approximately 26 million square feet of space, including buildings owned and leased by



Working together with shared data leads to better resource decisions. Photo by Yuen-Gi Yee

the Agency and space controlled by the General Services Administration. We also managed the acquisition, use, and disposal of personal property worth more than $700 million, including property on loan to State forestry departments. We manage approximately 5,000 units as living quarters for Forest Service employees—more than any other civilian agency.

MANAGING THE INFORMATION RESOURCE

Information Management

Efforts this year have made Forest Service employees more aware of the significance of managing their information. The Agency identified some of the changes that information technology will bring to the organization. For example, we now have the capability to achieve new levels of integrating the organization's data. This will allow us to share data throughout the organization, thereby eliminating data being duplicated for single-type information systems. Employees will have access to new and better information as a result of the network of integrated data and processes.

Another major effort was making the Directives System available electronically to all employees Service-wide. This system contains all of the Agency's Manuals and many of the related Handbooks that provide the basic policies and direction that govern all Forest Service programs throughout the Nation. It is available as an electronic library, with locator tools, and is located in a national information center in the Washington Office. The electronic library provides access to complete up-to-date directives, allows quick updates of directives, reduces the cost for production and distribution of preprinted directives, and maximizes the use of the distributed processing network available in the Agency.

Distributed Processing

In 1989, the Forest Service acquired a license to operate the Oracle Relational Data Base Management System and Fourth Generation Environment on all Data General systems Service-wide. This represents a significant step toward realizing our goal of sharing information easily and making it more accessible to all employees. Along with Oracle, the Forest Service began implementing an integrated data base. This shared repository will, over time, support operations more efficiently and provide the basis for more timely and consistent information for management and reporting.

The 1990 fiscal year will bring increased emphasis on integrating data and coordinating applications. It also will be a time when we move to acquire new technology and continue to improve the ways we do business in an electronic environment.

A Forest Service public affairs officer shares information about the White River National Forest with members of the U.S. Women's Ski Team at the World Alpine Ski Championship.
Photo by Jill Bauermeister

INFORMING THE AMERICAN PUBLIC

Because our mission is to care for the land and serve people, it is vital that we inform the public about how the land is being managed and that our managers be informed about how the people want to be served. The participation of an informed public in land management decisions is crucial to our ability to make decisions that will protect the land for use by future generations, while producing a sustained yield of the goods and services people want.

Controversy continues over such resource management issues as global climate change, deforestation of both tropical and temperate forests, preservation of old-growth or ancient forests, and protection of animal and plant species listed as sensitive, threatened, or endangered. Thus, the Forest Service must play an increasing role in telling the American people what knowledge is available and what actions are under way to promote wise use of forests and rangelands.

National Forest Scenic Byways

Driving for pleasure is the top form of outdoor recreation enjoyed by the people of the United States, and a drive to a nearby national forest has long been a favorite weekend activity for residents of both urban and rural areas. The Forest Service continued to add highways to the National Forest Scenic Byways program during 1989. The byways are a way to combine people's love of scenic beauty with the Agency's need to inform them of the land management activities practiced

A member of BSA Troop 28 plants seedlings for the Bienville Ranger District's "Living Legacy" Plantation. Photo by Lanay Russum

in the national forests. In traveling the National Forest Scenic Byways, people can see resource management at work while enjoying some of the most spectacular views in the United States. Magazine articles about the expanding Scenic Byways program produced thousands of requests for information about the byways in different parts of the country.

A new Forest Service partnership with Harley-Davidson, Inc., and other public information and interpretation efforts help the Scenic Byways program inform the public. The practice of promoting partnerships with the private sector to advertise and interpret the byways continues to pay high dividends.

World Alpine Ski Championships

The biggest opportunity for informing people during 1989 was the World Alpine Ski Championships held on the White River National Forest in Colorado in January. Media from around the world converged on this event, which was held in the United States for only the second time in history. Several messages about Forest Service activities were inserted in the programming. In addition, the Chief spoke at the opening ceremonies, which were broadcast and otherwise covered in the media.

The U.S. television audience for skiing is small compared with the audience for football, basketball, baseball, or golf—but it is still large when compared to the audience for land management practices. The World Championships received 10 hours of prime-time television coverage in the United States. Internationally, the World Championships are extremely popular, with European audiences receiving 245 hours of prime-time broadcasts from the event.

A primary public affairs objective at the World Championships was to make people aware of the extent of recreational activities, including skiing, on the national forests. Most people do not know that the Forest Service is the largest supplier of recreation (including downhill skiing) among Federal agencies.

Forest Service public affairs officers at the World Championships also set up a full range of field trips for the international media, resulting in a surprising amount of coverage of land management techniques. Topics included a research program for tagging elk, winter sports administration, cowboys and range management, and a backcountry ski hut program.

Take Pride in America

Forest Service efforts to involve the people of the United States in the Take Pride in America (TPIA) program paid off in 1989, with thousands of individual volunteers and partner organizations participating in projects on national forest lands. In July, three Forest Service units received national TPIA awards for their 1988 projects, three others were named finalists, and three were named semifinalists. The winners included volunteer projects for building and rehabilitating facilities at Balsam Lake Lodge on the Nantahala National Forest in North Carolina, building handicapped-accessible fishing piers, trail systems and a picnic area on the Gallatin National Forest in Montana, and establishing the "Living Legacy Plantation" on the Bienville National Forest in Mississippi in honor of the Constitution and the Bill of Rights.

Hurricane Hugo

Hurricane Hugo received the most intense media attention of any weather emergency in decades. Forest Service public affairs employees went to Columbia, South Carolina, to help with media coverage, and a special Hugo task force public affairs specialist handled national media from Washington, D.C.

Historic Anniversaries

Several important anniversaries during 1989 demonstrated that the management of natural resources has been a part of the Federal Government for many years. Such anniversaries offer the Forest Service opportunities to inform large groups of interested people about its programs and policies. In 1989, we made significant efforts in conjunction with the 20th anniversary of the Wild and Scenic Rivers System, the 25th anniversary of the National Wilderness Preservation System, the 25th anniversary of the Job Corps, and the 50th anniversary of the Caribbean National Forest.

In addition, the Forest Service began preparing for the celebration in 1991 of the 100th anniversary of the Forest Reserves—the first forest lands brought under Federal land management. The reserves later became the National Forest System.

Old-Growth and Spotted Owl

The dramatic increase in public controversy over the issues of old-growth forests and spotted owl habitat in the Pacific Northwest during 1989 required an equally dramatic increase in our effort to keep the public informed of the scientific, economic, and social issues involved in the debate.

Hurricane Hugo received the most intense media attention of any weather emergency in decades. An estimated 700 to 800 million board feet of timber were toppled on the Francis Marion National Forest. Photo by Bob Nichols

The Public Affairs Office struggled to keep agency employees informed, to provide information to interested user groups and individuals, and to ensure that the media had accurate material to keep the public informed.

Public Involvement

The Forest Service conducted major public involvement campaigns in 1989 on a new fire management policy for wilderness areas and national parks, on new oil and gas leasing regulations, and on the draft of the 1990 Resources Planning Act Recommended Program. Several Regions also conducted public involvement campaigns that involve revisions to their plans for the use of pesticides. The field offices and the national office also conducted many different, less prominent public involvement efforts during the year.

Timber Bridges

The Forest Service used a variety of media to build interest in and support for the construction of timber bridges. Workshops were held to persuade engineers, State highway officials, foresters, architects, professors, and wood products company representatives that wood bridges can replace many of the nation's substandard state and local steel and concrete bridges. At the same time, articles appeared in newspapers in many parts of the country to inform the public about what was being discussed at the conferences.

Tropical Forestry

The Forest Service conducted a wide-ranging public affairs effort to alert forestry officials, international agencies, and other interested parties to the Agency's increased activity in the area of tropical forestry. The Tropical Forestry program will include technical assistance, training, a high-priority research program, and support for international organizations. Elements in the public affairs campaign included the poster "Tropical Forestry," the brochure "Global Neighbors Growing Together," and dissemination of the Chief's address "The Challenge in Tropical Forestry," given to an international audience at the Institute of Tropical Forestry in Rio Piedras, Puerto Rico.

Pollution Solutions

Speaking for Woodsy Owl in a television public service announcement, the rap music group "D.J. Jazzy Jeff and the Fresh Prince" asked young people to send in their solutions to pollution problems in the United States. Nearly 4,000 youths answered their plea. The Forest Service sent each respondent an environmental message and a poster of "D.J. Jazzy Jeff and the Fresh Prince." The group later won two Grammy awards.

Photo by Ken Hammond

TABLES

CARING FOR THE LAND AND SERVING PEOPLE

F.S. Photo

National Forest System

Table No. Page

National Forest System--Continued

Table 1–Summary of National Forest System accomplishments compared to funded output levels and 5-year average--fiscal year 1989

Resource area	Activity	Units 1/	1989 Funded	1989 Accomplished	1989 Percent of funded	1985-89 average accomplishment	1989 as percent of 5-year average
Resource:							
Recreation	Visitor use	MM RVD's	240.0	252.5	105	237	107
Wilderness	Management	MM acres	32.5	32.5	100	32	100
Wildlife & fish	Habitat improvement	M acres	443.2	462.7	104	244 2/	190
Range	Permitted grazing use	MM AUM's	9.8	9.6	98	10	98
Timber	Sales offering	B bd. ft.	11.5	10.5	91	11	93
	Silvicultural exams	MM acres	5.3	5.4	102	6	96
	Reforestation						
	Appropriated funds	M acres	142.1	148.6 2/	105	153	97
	K-V funds 3/	M acres	296.3	327.3 2/	110	257	127
	Timber stand improvement						
	Appropriated funds	M acres	197.6	199.2	101	235	85
	K-V funds	M acres	179.5	146.1	81	128	114
Soil & water	Resource improvements 4/	M acres	27.8	39.2	141	15	257
Minerals	Leases and permits	Cases	25,015.0	29,152.0	117	27,062	108
Support:	Trail construction/reconstruction	Miles	1,688.0	1,724.0	102	1,175	147
	Road construction						
	Appropriated funds						
	Construction	Miles	259.0 5/	173.4 6/	67	482	36
	Reconstruction	Miles	585.0 5/	692.4 6/	118	1,102	63
	Purchaser credit						
	Construction 7/	Miles	2,427.0	1,584.3	65	2,039	78
	Reconstruction 7/	Miles	3,401.0	2,908.0	86	3,372	86
	Fuel management 8/	M acres	300.1	292.9	98	315	93
	Land acquired						
	Purchase and donation	M acres	78.0	114.1	146	74	155
	Exchanges	M acres	98.8	128.4	130	128	100
	Landline location	Miles	4,851.0	4,775.0	98	5,076	94

1/ M = thousand, MM = million, B = billion, RVD = recreation visitor day, AUM = animal unit month.
2/ Includes natural regeneration without site preparation.
3/ K-V = Knutson Vandenberg Act.
4/ Includes appropriated funds, excess timber receipt funds, and K-V funds.
5/ Does not include 2.9 miles of construction and 4.4 miles of reconstruction of Tongass Timber Supply Fund miles. Includes 41.1 miles accomplished with FY 1988 carryover dollars.
6/ Does not include 39.4 Tongass Timber Supply Fund miles.
7/ Average for 1985-89 includes 65.6 miles construction and 120.7 miles reconstruction turned back to Forest Service in 1989, and a 1985-89 average of 112 miles construction and 177 miles reconstruction..
8/ Does not include 2,869 acres accomplished through human resource programs and 366,950 acres with brush disposal funds. The 1985-89 average is 4,040 acres accomplished through Human Resource Programs and 341,620 acres using brush disposal funds.

Table 2–National Forest System funding--fiscal year 1989 compared to 1985-89 average

	1989				
	Actual	RPA low bound 1/	RPA high bound 2/	1985-89 average	Percent of actual to average
			1,000 constant 1989 dollars		
Minerals area management	28,439	28,037	32,887	29,160	97.5
Real estate management	25,503	21,341	27,690	23,223	109.8
Landline location	28,678	24,747	32,115	29,822	96.2
Maintenance of facilities	17,553	15,847	19,767	16,709	105.0
Forest fire protection	166,616	158,330	197,510	171,450	97.2
Fighting forest fires	375,000	1,076	1,345	179,185	209.3
Cooperative law enforcement	10,615	2,632	3,405	8,699	122.0
Forest road maintenance	80,729	52,982	66,089	75,832	106.5
Forest trail maintenance 3/	26,647	8,994	15,359	16,182	164.7
Sales administration and management 3/	236,590	183,996	258,331	209,899	112.7
Reforestation and stand improvement 4/	105,036 3/	94,578	132,789	103,182	101.8
Recreation use 3/	152,004	110,916	153,690	125,860	120.8
Wildlife and fish habitat management 3/	84,395	36,331	75,642	52,545	160.6
Range management	30,567	29,917	42,803	30,542	100.1
Soil and water management 3/	62,205	30,962	38,619	41,146	151.2
Subtotal	1,430,577	800,686	1,098,041	1,113,435	128.5
General Administration	272,116	269,768	336,519	281,928	96.5
Youth Conservation Corps	(1,000)	0 5/	0 5/	(2,079)	48.1
Construction and land acquisition:					
Construction of facilities 6/	32,364	12,619	15,742	28,960	111.8
Forest road construction	175,657	191,945	260,678	213,613	82.2
Forest trail construction 3/	19,847	5,348	33,438	11,799	168.2
Forest roads purchaser construction 7/	(120,770)	(165,956)	(317,474)	(123,965)	97.4
Subtotal	227,868	209,912	309,858	254,437	89.6

See footnotes at end of table.

Table 2–National Forest System funding--fiscal year 1989 compared to 1985-89 average--Continued

	1989				
	Actual	RPA low bound 1/	RPA high bound 2/	1985-89 average	Percent of actual to average
	1,000 constant 1989 dollars				
Land acquisition	64,205	0	0	52,815	121.6
Acquisition of lands for Winema NF	0	0	0	0	0.0
Acquisition of lands for National Forests, special acts	966	0	0	943	102.5
Acquisition of lands to complete land exchange	325	0	0	736	44.2
Appropriated trust fund	2	0	0	18	11.4
Range betterment 8/	3,946	3,946	3,946	4,073	96.9
Permanent appropriations	202,097	145,607 9/	158,132 9/	446,563	45.3
Trust funds	294,264	212,524	230,804	259,656	113.3
Subtotal	565,805	362,077	392,882	280,110	202.0
Total	2,496,366	1,642,443	2,137,300	2,416,745	103.3

1/ Information from 1985-2030 Resources Planning Act-Program. FY 1988 low bound of the RPA Program is based on the President's Budget for FY 1987.
2/ The RPA high bound amounts are estimations based on the proportional relationship of each resource area in the high bound program.
3/ Includes excess timber receipt dollars.
4/ Includes reforestation trust fund dollars.
5/ These items were not included in the 1985-2030 RPA Program.
6/ Excludes construction of research facilities, which is included in table 54.
7/ This account was taken off budget in 1982. For comparison, the amounts are shown as non-add items.
8/ Range betterment for actual and RPA equals 50 percent of actual grazing receipts.
9/ Does not include payments to States, counties, and National Grasslands; these were not included in the RPA Program.

Table 3–National Forest System funding--fiscal years 1985-89

	1989	1988	1987	1986	1985
			1,000 dollars		
Minerals area management	28,439	26,683	27,007	27,164	26,572
Real estate management	25,503	21,834	20,350	19,978	20,836
Landline location	28,678	26,651	26,980	27,399	29,090
Maintenance of facilities	17,553	16,533	15,055	14,124	14,792
Forest fire protection	166,616	165,029	159,388	151,669	156,591
Fighting forest fires	125,000	125,000	125,000	166,652	62,227
Cooperative law enforcement	10,615	9,669	6,675	6,659	7,212
Forest road maintenance	80,729	83,740	63,073	61,856	65,406
Forest trail maintenance 1/	25,185	20,026	11,385	9,537	9,256
Sales administration and management 1/	229,476	185,561	189,640	174,007	194,702
Reforestation and stand improvement 2/	102,597 1/	84,923	90,098	95,433	104,664
Recreation use 1/	149,566	123,742	113,287	99,017	102,057
Wildlife and fish habitat management 1/	79,619	47,444	42,552	37,087	36,726
Range management	30,567	29,225	27,576	26,894	28,170
Soil and water management 1/	57,429	35,271	33,981	30,524	31,808
Subtotal	1,157,572	1,001,331	952,047	948,000	890,109
General Administration (subtotal)	272,116	268,660	263,121	251,229	258,844
Youth Conservation Corps 3/	(1,000)	(1,000)	(1,000)	(3,234)	(3,234)
Construction					
Construction of facilities 4/	33,914	24,735	25,663	26,211	26,228
Forest road construction	175,657	171,764	233,310	180,935	228,914
Forest trail construction 1/	18,872	14,671	7,579	6,866	7,093
Forest roads purchaser construction 5/	(120,770)	(119,508)	(97,099)	(91,474)	(192,301)
Special projects		0	10,215 6/	0	0
Subtotal	228,443	211,170	276,767	214,012	262,235

See footnotes at end of table.

Table 3–National Forest System funding--fiscal years 1985-89--Continued

	1989	1988	1987	1986	1985
			1,000 dollars		
Land acquisition	64,205	49,076	52,236	31,356	50,535
Acquisition of lands for Winema NF	0	0	0	0	0
Acquisition of lands for National Forests, special acts	966	966	966	744	766
Acquisition of lands to complete land exchange	335	385	1,573	1,086	42
Appropriated trust fund	90	3	27	12	35
Range betterment	3,946	3,605	3,807	3,635	3,966
Permanent appropriations	474,117	452,270	359,643	651,533	393,634
Trust funds	267,748	296,334	254,019	202,517	172,541
Total	2,469,538	2,283,800	2,164,206	2,304,124	2,032,707

1/ Includes excess timber receipt dollars
2/ Includes reforestation trust fund dollars.
3/ Appropriations Act required minimum level of funding from National Forest funds; amounts not included in totals.
1985 - operated a $3.7 million program from available funds.
1986 - operated a $3.5 million program from available funds.
1987 - operated a $3.6 million program from available funds.
1988 - operated a $3.0 million program from available funds.
1989 - operated a $2.2 million program from available funds.
4/ Excludes construction of research facilities, which is included in table 54.
5/ This account was taken off budget in 1982. For comparison, the amounts are shown as non-add items.
6/ Funding for special purposes:
Mt. Elden Work Center - $0.3 million.
Highway construction Mount St. Helens National Volcanic Monument - $9.915 million.

Table 4–Summary of National Forest System accomplishments compared to RPA projections--fiscal year 1989

Resource area	Activity	Units 1/	1989 Accomplished	1989 RPA low bound	1989 RPA high bound
Final output 2/					
Timber	Sales offering	B board ft	10.5	9.5	11.5
Recreation	Visitor use	MM RVD's	252.5	226.5	244.0
Range	Permitted grazing use	MM AUM's	9.6	9.8	9.8
Minerals	Applications, proposals, and administration	M cases 3/	29.2	26.0	33.0
Wildlife & fish	User-days of recreation	MM WFUD's	41.8 4/	21.5	27.0
Intermediate output 5/					
Timber	Reforestation	M acres	475.9	335.0	408.0
	Timber stand improvement	M acres	345.3	302.0	387.0
Wildlife	Habitat improvement	M acres	462.7	- 6/	- 6/
Wilderness	Management	MM acres	32.5	35.0	36.0
Soil & water	Resource improvement 7/	M acres	39.2	8.3	11.0
Trails	Construction/ reconstruction	Miles	1,724	502.0	4,309.0
Roads	Construction/ reconstruction	Miles	5,545 8/	6,879 9/	10,895.0 9/
Fire	Fuels management 10/	M acres	659.9	670.0	- 6/
Lands	Purchase and donation	M acres	114.1	- 6/	- 6/

1/ B = billion, MM = million, M = thousand , RVD's = recreation visitor-days, AUM's = animal unit months, WFUD's = wildlife and fish user days.
2/ Final output = forest and rangeland goods and services purchased or consumed by the private sector or individual consumers.
3/ Reported as operating plans in the 1985-2030 Resources Planning Act Program.
4/ 41.8 WFUD's are included in 252.5 RVD's.
5/ Intermediate output = work performed by the Forest Service that contributes to the production of final outputs.
6/ These items were not reported in the RPA Program.
7/ Acres accomplished with appropriated funds, excess timber receipt funds, and KV funds.
8/ Includes appropriated and purchaser roads. Does not include 7.3 Tongass Timber Supply Fund miles.
9/ Represents a projection of miles constructed/reconstructed for all roads and is contingent on planned resource outputs.
10/ Does not include acres accomplished through Human Resource Programs, but does include acres accomplished with brush disposal funds.

Table 5–Draft and final forest plan environmental impact statements filed with the Environmental Protection Agency by Region as of September 30, 1989 1/

Northern Region

Final

Flathead (MT)
Lewis & Clark (MT)
Beaverhead (MT)
Helena (MT)
Lolo (MT)
Bitterroot (MT)
Custer (MT)
Deerlodge (MT)
Nezperce (ID)
Gallatin (MT)
Idaho Panhandle (ID)
Clearwater (ID)
Kootenai (MT)

Rocky Mountain Region

Final

Rio Grande (CO)
Nebraska (NE)
Bighorn (WY)
Arapaho-Roosevelt (CO)
Grand Mesa, Uncompahgre, and Gunnison (CO)
Routt (CO)
San Juan (CO)
Black Hills (SD)
White River (CO)
Pike-San Isabel (CO)
Medicine Bow (WY)
Shoshone (WY)

Southwestern Region

Final

Cibola (NM)
Tonto (AZ)
Carson (NM)
Coronado (AZ)
Gila (NM)
Lincoln (NM)
Prescott (AZ)
Apache-Sitgreaves (AZ)
Coconino (AZ)
Santa Fe (NM)
Kaibab (AZ)

Intermountain Region

Draft

Bridger-Teton (WY)
Boise (ID)

Final

Uinta (UT)
Wasatch-Cache (UT)
Targhee (ID)
Caribou (ID)
Fishlake (UT)
Toiyabe (NV)
Dixie (UT)
Humboldt (NV)
Payette (ID)
Challis (ID)
Ashley (UT)
Sawtooth (ID)
Manti-LaSal (UT)
Salmon (ID)

Pacific Southwest Region

Draft

Tahoe (CA)
Stanislaus (CA)
Lassen (CA)
Shasta-Trinity (CA)
Mendocino (CA)
Sierra (CA)
Modoc (CA)
Six Rivers (CA)

Final

Cleveland (CA)
Angeles (CA)
Plumas (CA)
Sequoia (CA)
Los Padres (CA)
Inyo (CA)
* Eldorado (CA)
* San Bernardino (CA)
* Lake Tahoe Basin Management Unit (CA)

Pacific Northwest Region

Draft

Deschutes (OR) 2/
Okanogan (WA) 2/
Wallowa-Whitman (OR) 2/
Wenatchee (WA) 2/
Olympic (WA) 2/
Siuslaw (OR) 2/
Umatilla (OR)
Gifford Pinchot (WA)
Mt. Hood (OR)
Umpqua (OR)
Malheur (OR)
Rogue River (OR)
Mt. Baker (WA)
Winema (OR)
Willamette (OR)

Final

* Colville (WA)
* Siskiyou (OR)
* Fremont (OR)
* Ochoco (OR)

Southern Region

Final

Francis Marion (SC)
Sumter (SC)
Mississippi (MS)
Kisatchie (LA)
Chattahoochee-Oconee (GA)
Daniel Boone (KY)
Jefferson (VA)
George Washington (VA)
Caribbean (PR)
Cherokee (TN)
Ozark-St. Francis (AR)
Florida (FL)
Ouachita (AR)
Alabama (AL)
Croatan-Uwharrie (NC)
Nantahala-Pisgah (NC)
Texas (TX)

Eastern Region

Final

Hoosier (IN)
Nicolet (WI)
Superior (MN)
Monongahela (WV)
Chippewa (MN)
Allegheny (PA)
Huron-Manistee (MI)
Chequamegon (WI)
Mark Twain (MO)
Hiawatha (MI)
Ottawa (MI)
White Mountain (NH)
Green Mountain (VT)
Shawnee (IL)
Wayne (OH)

Alaska Region

Final

Chugach (AK)
Tongass (AK) 3/

1/ Includes forest plans filed in previous years.
* Plans filed in 1989.
2/ Draft supplements filed on R-6 forest plans in previous years.
3/ 1979 Tongass plan under revision.

Table 6–Planned and accomplished minerals cases by Region--fiscal year 1989

Region	Cases	
	Planned	Accomplished
Northern	4,822	4,910
Rocky Mountain	2,160	2,422
Southwestern	1,201	2,307
Intermountain	3,806	3,528
Pacific Southwest	3,284	3,460
Pacific Northwest	3,583	3,133
Southern	3,505	5,884
Eastern	2,146	3,021
Alaska	508	487
Total	25,015	29,152

Table 7–Energy mineral workload and production--fiscal years 1985-89

Fiscal year	Acres under lease	Energy-related cases	Oil production	Gas production	Coal production
	Millions		*Barrels*	*1,000 cu.ft.*	*Short tons*
1985	33.3	15,473	13,000,000	217,000,000	15,600,000
1986	28.2	14,194	13,000,000	180,000,000	21,000,000
1987	23.2	14,023	19,000,000	190,000,000	41,200,000
1988	17.8	13,300	22,800,000	191,000,000	41,200,000
1989 1/	14.2	11,743	20,851,000	204,000,000	65,500,000

1/ All figures are estimated.

Table 8–Land acquisition and exchange--fiscal year 1989

	Acres	Cases	Value
			Million dollars
Purchase	113,101	975 1/	50
Exchange	128,411	183	95
Donation	961	16	0.6
Total	242,473	1,174	145.6

1/ Includes 724 cases in the Lake Tahoe Basin, CA and NV.

Table 9–Miles of landline location by Region--fiscal year 1989

Region	Total miles boundary	1989 mileage accomplishment	Total miles surveyed
Northern	30,664	605	6,948
Rocky Mountain	51,433	344	4,849
Southwestern	19,991	256	6,249
Intermountain	28,659	279	4,674
Pacific Southwest	29,577	733	11,490
Pacific Northwest	25,627	679	13,956
Southern	42,280	929	36,493
Eastern	42,642	848	8,996
Alaska 1/	1,536	102	1,122
Total	272,409	4,775	94,777

1/ Does not reflect changes due to Alaska Native Claims Settlement Act of 1971 (85 Stat. 688), as amended, and the Alaska Statehood Act of 1958 (72 Stat. 339), as amended. As the land selections are overlapping and/or in a constant state of change, the Region is not keeping track of the boundary changes at this time.

Table 10–Lands administered by the Forest Service as of September 30, 1989

State, Commonwealth, or Territory 1/	National Forests, purchase units, research areas, and other areas	National Grasslands	Land utilization projects	Total
		Acres		
Alabama	649,591	0	40	649,631
Alaska	22,483,751	0	0	22,483,751
Arizona	11,278,317	0	0	11,278,317
Arkansas	2,484,690	0	0	2,484,690
California	20,518,457	0	19,222	20,537,679
Colorado	13,832,729	612,023	440	14,445,192
Connecticut	24	0	0	24
Florida	1,100,086	0	0	1,100,086
Georgia	857,809	0	0	857,809
Hawaii	1	0	0	1
Idaho	20,411,013	47,746	0	20,458,759
Illinois	263,377	0	0	263,377
Indiana	187,908	0	0	187,908
Kansas	0	108,175	0	108,175
Kentucky	665,330	0	0	665,330
Louisiana	600,574	0	0	600,574
Maine	52,860	0	260	53,120
Michigan	2,802,298	0	959	2,803,257
Minnesota	2,807,855	0	0	2,807,855
Mississippi	1,148,082	0	0	1,148,082
Missouri	1,460,381	0	13,104	1,473,485
Montana	16,797,507	0	0	16,797,507
Nebraska	257,504	94,316	0	351,820
Nevada	5,104,247	0	0	5,104,247
New Hampshire	714,904	0	0	714,904
New Mexico	9,189,154	136,417	240	9,325,811
New York	13,232	0	0	13,232
North Carolina	1,221,161	0	0	1,221,161
North Dakota	743	1,105,046	0	1,105,789
Ohio	186,643	0	0	186,643
Oklahoma	249,525	46,300	0	295,825
Oregon	15,513,381	111,379	856	15,625,616
Pennsylvania	511,767	0	0	511,767
Puerto Rico	27,846	0	0	27,846
South Carolina	605,037	0	0	605,037
South Dakota	1,134,037	862,816	0	1,996,853
Tennessee	626,256	0	0	626,256
Texas	635,606	117,533	0	753,139
Utah	8,040,566	0	0	8,040,566
Vermont	326,389	0	0	326,389
Virgin Islands	147	0	0	147
Virginia	1,639,394	0	0	1,639,394
Washington	9,149,452	0	738	9,150,190
West Virginia	1,020,842	0	0	1,020,842
Wisconsin	1,509,748	0	0	1,509,748
Wyoming	8,682,523	572,211	0	9,254,734
Total	186,762,744	3,813,962	35,859	190,612,565

1/ States not listed have no lands administered by the Forest Service.

Table 11–Fuels treatment acreage accomplished by appropriation--fiscal year 1989

Region	Accomplishment				RPA low bound 1/
	Forest fire protection	Volunteer and contributed work	Brush disposal funds	Total	
	Acres				
Northern	8,352	5	49,597	57,954	36,494
Rocky Mountain	6,340	0	9,967	16,307	15,579
Southwestern	31,737	803	63,540	96,080	75,209
Intermountain	7,204	0	25,682	32,886	66,192
Pacific Southwest	15,718	2,000	54,304	72,022	50,790
Pacific Northwest	27,214	51	162,349	189,614	204,610
Southern	192,354	0	0	192,354	213,600
Eastern	3,805	10	1,511	5,326	7,215
Alaska	225	0	0	225	70
Total	292,949	2,869	366,950	662,768	669,759

1/ Fuel treatment acreages were not reported in the high bound of the RPA Program.

Table 12–Timber offered, sold, unsold and harvested--fiscal years 1985-89

	1989	1988	1987	1986	1985
Offered: 1/					
Volume (billion board feet)	10.5	11.3	11.5	11.7	11.5
Sold:					
Number of sales	275,895.0	251,557.0	289043.0	349977.0	366874.0
Volume (billion board feet)	8.4 2/	11.0	11.3	11.0	10.8
Value (million dollars) 2/	1,077.5	1,254.4	1,003.4	757.0	558.2
Not sold: 3/					
Volume (billion board feet)	2.1	0.3	0.2	0.7	0.7
Harvested:					
Volume (billion board feet)	12.0	12.6	12.7	11.8	10.9
Value (million dollars)	1,309.7	1,235.7	1,016.0	786.9	720.6

1/ This is the number of sales that can be converted to board feet. Not included are 250,081 sales of nonconvertible product in FY 1989.

2/ Due to appeals and litigation, Spotted Owl Temporary Restraining Order delayed the offer and award of 1.6 billion board feet of new sales in Region 6 and .2 billion board feet in Region 5.

3/ This is the high bid value from all sales sold and includes stumpage, cost of reforestation, stand improvement costs, and timber salvage. Does not include value of roads or brush disposal.

4/ Difference between total volume offered and sold.

5/ This is the current stumpage rate for the actual volume harvested and includes the reforestation and stand improvement costs and timber salvage. Does not include value of roads or brush disposal.

Table 13--Timber offered, sold, unsold and harvested by Region--fiscal years 1988-89

	1989				1988			
	Offered 1/	Sold 2/	Unsold 3/	Harvested 4/	Offered 1/	Sold 2/	Unsold	Harvested 4/
	Million board feet							
Northern	913.8	922.6	(8.8)	1,024.3	967.6	913.0	54.6	977.8
Rocky Mountain	378.7	356.0	22.7	422.1	384.6	413.2 5/	(28.6)	456.3
Southwestern	401.8	357.3	44.5	511.0	372.6	406.6	(34.0)	495.2
Intermountain	358.3	388.4	(30.1)	419.7	390.7	373.9	16.8	476.9
Pacific Southwest	1,713.2	1,498.9	214.3	1,984.7	1,869.5	1,953.3	(83.8)	2,216.3
Pacific Northwest	4,413.2	2,811.3	1,601.9	5,230.8	5,056.1	4,918.9	137.3	5,407.8
Southern	1,205.0	1,169.4	35.6	1,127.5	1,210.4	1,185.2	25.2	1,366.1
Eastern	809.2	810.2	-1.0	784.7	746.9	764.2	(17.3)	802.6
Alaska	321.6	100.4	221.2 6/	446.1	349.3	70.0	279.3 6/	397.3
Total 7/	10,514.8	8,414.5	2,100.3	11,950.9	11,347.7	10,998.3 5/	349.5	12,596.3

1/ Sales offered for the first time.
2/ Does not include the volume of long-term sales released for harvesting. Includes miscellaneous small sales that were previously offered and/or sold and were reoffered and sold in the fiscal year being displayed.
3/ Due to appeals and litigation, Spotted Owl Temporary Restraining Order delayed the offer and award of 1.6 billion board feet of new sales in in Region 6 and .2 billion board feet in Region 5.
4/ Includes the volume harvested on long-term sales.
5/ Corrected figure; reported wrong in 1988 for Rocky Mountain.
6/ Includes long-term sales volume prepared in the offered column.
7/ Columns may not add due to rounding.

Table 14–Timber sold and harvested by State--fiscal year 1989 1/

State or Commonwealth 3/	Timber sold			Timber harvested 2/	
	Sales	Volume	Value 4/	Volume	Value 4/
		MBF 5/	*Actual dollars*	*MBF 5/*	*Actual dollars*
Alabama	455	81,014	5,936,766	74,694	5,388,499
Alaska	155	100,447	10,233,759	446,106	3,714,477 6/
Arizona	18,353	254,199	18,621,923	353,608	23,531,979
Arkansas	2,805	168,712	14,413,987	201,203	15,892,684
California	55,665	1,501,921	233,343,349	1,991,690	235,179,600
Colorado	28,946	189,305	5,117,813	211,424	2,359,750
Florida	115	94,981	6,900,640	121,285	7,529,439
Georgia	708	73,527	3,589,262	68,939	3,040,894
Idaho	28,832	755,002	62,837,096	784,141	43,078,486
Illinois	18	138	1,411	5,258	117,543
Indiana	35	820	121,163	2,931	229,847
Kentucky	916	45,935	2,093,034	33,158	947,410
Louisiana	530	127,527	10,704,426	108,445	8,382,431
Maine	9	278	12,406	2,543	92,156
Michigan	762	234,711	5,812,736	226,994	4,623,011
Minnesota	440	183,707	3,752,572	166,645	1,980,268
Mississippi	807	223,096	21,713,777	157,159	15,405,089
Missouri	2,182	69,084	3,540,321	64,876	2,843,870
Montana	16,191	444,880	40,056,671	539,555	24,774,294
Nebraska	28	61	510	152	3,874
Nevada	1,290	2,325	18,071	2,153	19,583
New Hampshire	49	29,932	1,247,902	35,866	1,011,718
New Mexico	17,575	103,105	2,539,769	157,424	4,211,635
New York	29	403	8,718	570	58,282
North Carolina	743	72,085	1,722,319	77,424	1,883,922
North Dakota	43	65	600	32	380
Ohio	151	7,160	522,821	8,506	583,015
Oklahoma	109	15,025	863,401	20,242	1,097,561
Oregon	39,055	2,193,238	480,416,840	3,928,596	691,993,234
Pennsylvania	137	84,105	17,787,732	65,250	12,405,884
South Carolina	565	98,331	9,272,996	84,733	8,299,888
South Dakota	2,965	93,399	7,249,007	115,981	4,985,453
Tennessee	205	36,230	1,559,943	30,906	1,282,305
Texas	792	63,377	4,911,319	86,426	6,636,454
Utah	18,588	72,056	1,773,898	78,965	1,787,589
Vermont	181	8,509	307,486	10,220	349,600
Virginia	730	64,467	969,063	58,144	1,021,957
Washington	20,915	620,910	87,900,732	1,306,814	165,751,330
West Virginia	189	43,488	2,940,236	41,628	2,065,936
Wisconsin	144	152,976	3,332,771	158,160	2,618,853
Wyoming	13,488	104,056	3,385,228	122,091	2,550,897
Total 7/	275,895	8,414,587	1,077,534,474	11,950,937	1,309,731,077

1/ Excludes nonconvertible products such as Christmas trees, cones, burls, etc.
2/ Preliminary.
3/ States not listed had no timber sold or harvested in fiscal year 1988.
4/ Includes Knutson-Vandenberg and salvage sale receipts. Does not include brush disposal and road costs.
5/ MBF = thousand board feet.
6/ The timber sale harvest values for Alaska include repayments as a result of rate redetermination for short-term sales due to the Federal Timber Contract Payment Modification Act of 1984.
7/ Columns may not add due to rounding.

Table 15–Number of sales, volume, and value of timber sold on National Forest lands by size class--fiscal years 1985-89

	Sale size class							
	To $300	$301-$2,000	$2,001-2,000MBF 1/	2001-5,000MBF	5001-15,000MBF	15,001MBF and over	Nonconvertibles 2/	Total less nonconvertibles 3/
1985								
Number of sales	348,999	13,563	3,113	562	595	42	225,493	366,874
Volume (MBF)	830,237	589,475	1,698,402	1,868,425	5,063,888	768,564	0	10,818,991
Value ($1,000)	5,810.1	8,562.2	80,568.9	100,221.6	314,475.0	48,547.3	1,662.7	558,185.1
1986								
Number of sales	325,646	20,320	2,763	587	606	55	205,132	349,977
Volume (MBF)	851,974	363,324	1,517,092	1,922,224	5,269,466	1,042,497	0	10,966,577
Value ($1,000)	7,359.1	8,533.7	76,133.3	116,679.4	466,693.2	81,624.3	1,671.4	757,023.0
1987								
Number of sales	273,210	11,795	2,684	641	662	51	224,751	289,043
Volume (MBF)	672,064	245,148	1,533,199	2,087,251	5,833,972	947,353	0	11,318,987
Value ($1,000)	4,615.2	4,550.9	96,869.4	163,158.6	633,067.2	101,128.6	1,885.9	1,003,389.9
1988								
Number of sales	233,567	13,791	2,806	701	652	40	249,784	251,557
Volume (MBF)	550,589	242,616	1,514,723	2,304,845	5,562,653	792,807	0	10,968,233
Value ($1,000)	3,944.0	4,691.7	114,447.7	252,343.8	791,130.5	87,829.9	2,401.5	1,254,387.6
1989								
Number of sales	253,542	18,392	2,849	615	462	35	250,081	275,895
Volume (MBF)	555,149	276,650	1,612,985	1,947,180	3,510,835	511,786	0	8,414,585
Value ($1,000)	4,244	6,830	130,713	225,523	629,542	80,683	2,864	1,077,534

1/ MBF = thousand board feet.
2/ Nonconvertible products include Christmas trees, cones, burls, etc.
3/ May not add due to rounding.

Table 16—Statement of timber sale revenues and expenses--fiscal year 1989 1/

Account activity	Totals 2/
	1,000 constant 1989 dollars
Revenues	
Timber sales	1,310,868
Purchaser road credits established	112,270
Associated charges	93,682
Interest and penalties	1,695
Total revenues	1,518,515
Controllable expenses	
Sale administration expenses	72,260
Sale activity pool allowance	467,557
Growth activity pool allowance	98,414
Facility depreciation	1,548
Timber program General Administration	136,942
Total operating expenses	776,721
Gain/loss before payment to states	741,794
Payment to states	339,079
Net gain/loss from timber sales	402,715
Volume harvested (BBF) 3/	11.9

1/ Source data from Statement of Revenues and Expenses of Timber Sale Program Information Reporting System (TSPIRS). TSPIRS is an accounting report which allocates capital expenditures, such as costs for roads, facilities, and investments in roads, differently from that in cash flow reports for capital investments and operating costs as represented in table 20. For this reason, the various cost and expenditure data in the two tables are not directly comparable.

2/ These are national totals for 1989. The Timber Sale Program Annual Report, with Forest and State level information, will be available in February.

3/ BBF = billion board feet.

Table 17—Employment, income, and program level account--fiscal year 1989 1/

	Units	Totals
		1,000 constant 1989 dollars
Employment and income		
Total jobs	Jobs	132,371
Total income	$ Amount	4,401,805
Federal income taxes generated	$ Amount	666,717
Related timber information		
Timber		
Offered	MMBF 2/	10,566
Sold	MMBF	8,448
Harvested		
Sawtimber	MMBF	9,491
Roundwood	MMBF	1,288
Other	MMBF	1,190
Total harvested	MMBF	11,969
Total acres harvested	Acres	1,015,418
Fuelwood		
Free use	MMBF	229
Nonconvertible products		
Christmas trees sold	Trees	421,149
Other	$ Amount	2,391
Regeneration acres treated	Acres	480,742
Timber stand improvement treatments	Acres	335,862
Forest road program (in support of the timber program)		
Appropriated		
Construction	Miles	156
Reconstruction	Miles	405
Subtotal	Miles	561
Purchaser credit		
Construction	Miles	1,662
Reconstruction	Miles	3,017
Subtotal	Miles	4,679
Total roads	Miles	5,240

1/ These are national totals for 1989. The Timber Sale Program Annual Report, with Forest and State level information, will be available in February.

2/ MMBF = million board feet.

Table 18—The economic account--fiscal year 1989 1/

	Totals
	1,000 constant 1989 dollars
Present value of benefits	
Positive effects	
Timber	1,847,404
Recreation	5,747
Wildlife	25,224
Fisheries	5,401
Grazing	4,475
Soils	18
Water	81,739
Total	1,970,008
Negative effects	
Timber	5
Recreation	1,917
Wildlife	7,813
Fisheries	1,083
Grazing	0
Soils	165
Water	74
Total	11,057
Total present benefits (positive less negative)	1,958,951
Present value of costs	
Timber	578,738
Roads	230,118
Recreation	486
Wildlife	8,081
Fisheries	1,765
Grazing	987
Soils	106
Water	1,039
Total	821,320
Present net value	1,137,631

1/ These are national totals for 1989. The Timber Sale Program Annual Report, with Forest and State level information, will be available in February.

Table 19–Uncut timber volume under contract by Region--fiscal years 1985-89

Region	1989	1988	1987	1986	1985
			Million board feet 1/		
Northern	2,210	2,382	2,618	3,274	3,812
Rocky Mountain	912	1,036	1,154	1,208	1,361
Southwestern	606	768	936	1,088	1,228
Intermountain	612	620	772	848	896
Pacific Southwest	2,650	3,275	3,943	4,456	7,261
Pacific Northwest	7,112	9,959	11,241	10,308	18,263
Southern	1,673	1,543	1,948	2,186	2,785
Eastern	1,732	1,778	1,820	2,054	2,034
Alaska	377	417	438 2/	562	509
Total	17,884	21,778	24,870	25,984 3/	38,149

1/ Volume in local scale. Long-term sales not included. Long-term sales volume under contract at the end of fiscal year 1988 was 6,594 million board feet and 6,364 million board feet in 1987.
2/ Corrected figure; reported wrong in 1987 report.
3/ This volume under contract has been reduced by 9,748 million board feet as a result of the Federal Timber Contract Payment Modification Act of 1984.

Table 20–Timber sale funding--fiscal years 1987-89 1/

	1989	1988	1987
		1,000 dollars	
National Forest System			
Timber management	149,782	141,228	137,463
Harvest administration	57,556	44,333	52,177
Excess timber receipts	29,252	-	-
Subtotal	236,590	185,561	189,640
Support to timber sales program			
Minerals	1,396	1,077	1,521
Forest Fire Protection	4,564	3,843	4,522
Recreation	10,358	7,992	8,380
Wildlife and Fish	9,470	8,613	7,020
Range	881	988	797
Soil and Water	8,619	8,103	7,666
Subtotal	35,288	30,616	29,906
Road construction			
Forest Service construction	120,028	128,257	185,400
Purchaser construction	(81,193)	(103,781)	(97,099)
Purchaser construction by the Forest Service	2,762	4,330	5,467
Subtotal	122,790	132,587	190,867
Total, appropriated accounts	394,668	348,764	410,413
Special accounts 2/			
Timber salvage sales	47,561	61,502	26,000
Tongass timber supply fund 3/	35,034	34,073	42,254
Subtotal	82,595	95,575	68,254
Total	477,263	444,339	478,667

1/ Timber sale preparation and offer costs displayed are the actual appropriated funds for FY 1987-89. Costs displayed in TSPIRS tables 16-18 are the accrued costs for the FY 1989 timber program.
2/ Includes General Administration expenses.
3/ Does not include reforestation/timber stand improvement.

Table 21–Reforestation funding and accomplishments by funding source-- fiscal years 1985-89

	Appropriated	Knutson-Vandenberg	Total
1985			
Million dollars 1/	65.4	71.9	137.4
1,000 acres	175.2	194.6	369.8
Constant dollars/acre	373.5	369.7	371.5 2/
1986			
Million dollars 1/	57.3	74.5	131.8
1,000 acres	148.9	215.1	364.0
Constant dollars/acre	384.7	346.3	362.0 2/
1987			
Million dollars 1/	51.7	98.8	150.6
1,000 acres	139.4	254.8	394.2
Constant dollars/acre	371.1	387.8	381.9 2/
1988			
Million dollars 1/	48.9	118.7 3/	167.5 3/
1,000 acres	133.3 4/	282.8 5/	416.1
Constant dollars/acre	366.7	326.0	402.7
1989			
Million dollars 1/	57.2 6/	114.0 7/	171.2 7/
1,000 acres	148.6 8/	327.3	475.9
Constant dollars/acre	384.9	323.2	342.5

1/ All dollars are constant 1989. No General Administration funds included. Does not include funds for nursery and tree improvement.
2/ Weighted average.
3/ Although $118.7 million were authorized in 1988, only $92.2 million were obligated. The cost/acre is based upon the obligated amount. The unspent funds were returned to the K-V trust fund pool for future obligations.
4/ Does not include the 24,900 acres of certified natural regeneration without site preparation reported as established in FY 1988.
5/ Does not include the 11,900 acres of certified natural regeneration without site preparation reported as established in FY 1988.
6/ Includes $9.7 million of resource management excess timber receipts. These funds are to be used to reforest lands damaged by forest fires in 1987 and 1988.
7/ Although $114.0 million were authorized, only $105.8 million were obligated. The cost/acre is based upon the obligated amount. The unspent funds were returned to the K-V trust fund pool for future obligations.
8/ Includes 53,000 acres of certified natural regeneration without site preparation reported as established in FY 1989, but does not include 16,300 acres of other carryover reforestation.

Table 22–Reforestation program needs--fiscal years 1989-91

	Current or anticipated	Annual program appropriated funds 1/	
	1,000 acres	*1,000 acres*	*Million dollars*
10/1/88 balance	1,176		
Fiscal year 1989:			
New needs 2/	541		
Projected accomplishments	-476	148.6	47.527
contributed 3/	-16		
10/1/89 balance	1,225		
Fiscal year 1990:			
New needs 2/	465		
Projected accomplishments	-473	122.5	50.730
10/1/90 balance	1,217		
Fiscal year 1991:			
New needs 2/	450		
Projected accomplishments	-480		
10/1/91 balance	1,187		

1/ Includes Reforestation Trust Fund pursuant to P.L. 96-451, as amended.
2/ New needs are the results of timber harvests, regeneration failures, and natural disasters such as fires, storms, insects, diseases, and other changes.
3/ These acres were accomplished on the ground with other contributed funds and are included here to show total acres treated but are not included in other tables.

Table 23–Reforestation needs as of October 1, 1989, by State, forest, and site productivity class

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/ 0-49	50-84	85-119	120+	Total acres
Alabama					
NFs in Alabama (subtotal)	0	3,554	2,959	666	7,179
Alaska					
Chugach	0	35	0	0	35
Tongass-Chatham	0	1,334	803	2,072	4,209
Tongass-Ketchikan	0	0	424	17,281	17,705
Tongass-Stikine	0	97	1,037	6,718	7,852
Subtotal	0	1,466	2,264	26,071	29,801
Arizona					
Apache-Sitgreaves	460	113	40	0	613
Coconino	3,876	80	0	0	3,956
Kaibab	0	0	0	0	0
Prescott	585	3,747	0	0	4,332
Tonto	184	17	0	0	201
	0	0	0	0	0
Subtotal	5,105	3,957	40	0	9,102
Arkansas					
Ouachita	193	14,761	12,854	941	28,749
Ozark-St. Francis	0	2,478	9	0	2,487
Subtotal	193	17,239	12,863	941	31,236
California					
Angeles	0	180	0	0	180
Cleveland	321	0	0	0	321
Eldorado	0	0	4795	744	5,539
Inyo	247	927	139	0	1,313
Klamath	5,791	16,836	16,092	11,819	50,538
Lassen	0	6,241	2,236	1,136	9,613
Los Padres	50	324	131	69	574
Mendocino	4,779	19,058	6,023	1,923	31,783
Modoc	0	4,169	1,471	1,943	7,583
Plumas	22	5,553	8,777	738	15,090
Rogue River	0	86	368	0	454
San Bernardino	45	406	30	0	481
Sequoia	289	6,680	3,285	1,852	12,106
Shasta	0	3,828	5,296	3,597	12,721

See footnotes at end of table.

Table 23--Reforestation needs as of October 1, 1989, by State, forest, and site productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/ 0-49	50-84	85-119	120+	Total acres
Sierra	0	5,716	3,874	2,292	11,882
Siskiyou	0	0	1,658	0	1,658
Six Rivers	0	130	5,495	2,292	7,917
Stanislaus	311	5,060	31,480	5,121	41,972
Tahoe	1,141	4,038	4,928	11,699	21,806
Trinity	112	500	9,662	91	10,365
Toiyabe	1,219	67	0	0	1,286
Lake Tahoe Basin	0	0	100	0	100
Subtotal	14,327	79,799	105,840	45,316	245,282
Colorado					
Arapaho and Roosevelt	9,251	2,755	0	0	12,006
Grand Mesa, Uncompahgre, and Gunnison	2,306	1,769	138	0	4,213
Pike and San Isabel	1,601	282	0	0	1,883
Routt	7,105	1,058	0	0	8,163
San Juan	802	3,429	81	0	4,312
White River	246	406	35	0	687
Subtotal	21,311	9,699	254	0	31,264
Florida					
NFs in Florida (subtotal)	16,248	7,494	3,042	525	27,309
Georgia					
Chattahoochee and Oconee (subtotal)	0	1,672	5,110	533	7,315
Idaho					
Boise	910	28,827	9,858	2,797	42,392
Caribou	0	86	280	0	366
Challis	0	672	3	0	675
Clearwater	6,417	214	3,157	8,066	17,854
Idaho Panhandle	16,467	1,567	7,155	5,761	30,950
Kootenai	97	28	592	164	881
Lolo	0	21	0	0	21
Nezperce	1,712	1,425	3,562	1,957	8,656
Payette	763	2,468	4,060	35	7,326
Salmon	4,188	3,312	0	0	7,500
Sawtooth	323	165	0	0	488
Targhee	0	10,328	0	0	10,328
Subtotal	30,877	49,113	28,667	18,780	127,437

See footnotes at end of table.

Table 23–Reforestation needs as of October 1, 1989, by State, forest, and site productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/ 0-49	50-84	85-119	120+	Total acres
Illinois					
Shawnee (subtotal)	0	457	0	5	462
Indiana					
Hoosier (subtotal)	0	0	1,147	590	1,737
Kentucky					
Daniel Boone (subtotal)	28	843	7,127	326	8,324
Louisiana					
Kisatchie (subtotal)	0	1,170	3,067	8,864	13,101
Maine					
White Mountain (subtotal)	141	161	53	12	367
Michigan					
Hiawatha	1,789	1,843	419	45	4,096
Huron-Manistee	2,420	3,063	111	10	5,604
Ottawa	1,421	11,106	1,130	46	13,703
Subtotal	5,630	16,012	1,660	101	23,403
Minnesota					
Chippewa	133	0	0	5	138
Superior	2,645	4,942	690	133	8,410
Subtotal	2,778	4,942	690	138	8,548
Mississippi					
NFs in Mississippi (subtotal)	219	3,189	6,601	11,449	21,458
Missouri					
Mark Twain (subtotal)	0	15,400	104	15	15,519
Montana					
Beaverhead	1,236	1,344	20	0	2,600
Bitterroot	4,042	1,651	919	82	6,694
Custer	114	78	39	0	231
Deerlodge	2,227	34	145	0	2,406
Flathead	10,515	1,633	3,485	574	16,207
Gallatin	1,150	1,386	208	0	2,744
Helena	4,053	470	335	0	4,858
Kootenai	20,706	4,020	11,052	2,078	37,856
Lewis and Clark	1,503	177	100	0	1,780
Lolo	5,998	3,218	2,208	214	11,638
Subtotal	51,544	14,011	18,511	2,948	87,014

See footnotes at end of table.

Table 23–Reforestation needs as of October 1, 1989, by State, forest, and site productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/ 0-49	50-84	85-119	120+	Total acres
Nevada					
Lake Tahoe Basin (subtotal)	0	0	0	0	0
New Hampshire					
White Mountain (subtotal)	1,090	1,693	343	161	3,287
New Mexico					
Carson	1,437	5,576	0	0	7,013
Cibola	508	1,121	0	0	1,629
Gila	669	1,512	0	0	2,181
Lincoln	0	1,600	0	0	1,600
Santa Fe	347	2,917	2,250	0	5,514
Subtotal	2,961	12,726	2,250	0	17,937
New York					
Green Mountain (subtotal)	0	10	0	0	10
North Carolina					
NFs in North Carolina (sub)	417	3,155	254	87	3,913
Ohio					
Wayne (subtotal)	0	771	1,047	1,400	3,218
Oklahoma					
Ouachita (subtotal)	0	342	371	142	855
Oregon					
Deschutes	4,638	14,834	1,935	762	22,169
Fremont	4,011	3,326	1,838	8	9,183
Klamath	0	0	339	959	1,298
Malheur	2,011	11,805	0	0	13,816
Mt. Hood	459	16,915	11,895	2,447	31,716
Ochoco	784	3,995	72	0	4,851
Rogue River	0	4,185	9,109	176	13,470
Siskiyou	0	713	6,710	2,852	10,275
Siuslaw	0	0	0	5,726	5,726
Umatilla	1,940	16,757	482	0	19,179
Umpqua	30	858	12,781	3,237	16,906
Wallowa-Whitman	9,780	39,113	4,998	40	53,931
Willamette	0	1,077	6,648	20,997	28,722
Winema	2,363	2,496	2,220	1,982	9,061
Subtotal	26,016	116,074	59,027	39,186	240,303

See footnotes at end of table.

Table 23–Reforestation needs as of October 1, 1989, by State, forest, and site productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/ 0-49	50-84	85-119	120+	Total acres
Pennsylvania					
Allegheny (subtotal)	4,033	3,015	0	0	7,048
Puerto Rico					
Caribbean (subtotal)	0	0	57	0	57
South Carolina					
Francis Marion and Sumpter (subtotal)	0	223	3,527	2,731	6,481
South Dakota					
Black Hills (subtotal)	11,459	6,969	0	0	18,428
Tennessee					
Cherokee (subtotal)	70	1,432	1,486	4,890	7,878
Texas					
NFs in Texas (subtotal)	0	5,541	13,916	1,027	20,484
Utah					
Ashley	49,186	17,112	0	0	66,298
Dixie	1,399	2,942	0	0	4,341
Fishlake	0	526	0	0	526
Manti-LaSal	0	364	100	0	464
Uinta	0	0	408	0	408
Wasatch-Cache	599	899	0	0	1,498
Subtotal	51,184	21,843	508	0	73,535
Vermont					
Green Mountain (subtotal)	0	422	195	0	617
Virginia					
George Washington	1,636	857	30	461	2,984
Jefferson	224	3,064	420	507	4,215
Subtotal	1,860	3,921	450	968	7,199

See footnotes at end of table.

Table 23–Reforestation needs as of October 1, 1989, by State, forest, and site productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/ 0-49	50-84	85-119	120+	Total acres
Washington					
Colville	1,178	9,847	4,874	0	15,899
Gifford Pinchot	0	7,023	9,121	2,341	18,485
Idaho Panhandle	350	10	951	469	1,780
Mt. Baker-Snoqualmie	0	448	3,530	671	4,649
Okanogan	5,668	10,516	1,459	0	17,643
Olympic	8	842	5,377	3,278	9,505
Umatilla	29	1,349	0	0	1,378
Wenatchee	643	4,159	5,645	271	10,718
Subtotal	7,876	34,194	30,957	7,030	80,057
West Virginia					
George Washington	96	25	0	56	177
Monongahela	25	0	0	45	70
Subtotal	121	25	0	101	247
Wisconsin					
Chequamegon	346	3,981	320	0	4,647
Nicolet	812	3,579	318	487	5,196
Subtotal	1,158	7,560	638	487	9,843
Wyoming					
Black Hills	4,850	6,984	0	0	11,834
Bighorn	2,265	1,333	0	0	3,598
Bridger-Teton	28	1,542	2,053	0	3,623
Medicine Bow	6,127	99	0	0	6,226
Shoshone	1,097	632	174	0	1,903
Targhee	0	365	0	0	365
Subtotal	14,367	10,955	2,227	0	27,549
Total	271,013	461,049	317,252	175,490	1,224,804

1/ States not listed had no reforestation needs as of October 1, 1988.
2/ Site productivity class refers to the amount of wood produced in cubic feet per acre per year in a natural unmanaged stand.

Table 24–Timber stand improvement funding and accomplishments by funding source--fiscal years 1985-89

	Appropriated	Knutson-Vandenberg	Total
1985			
Million dollars 1/	38.3	22.0	60.3
1,000 acres	300.5	120.9	421.4
Constant dollars/acre	127.5	182.0	143.1 2/
1986			
Million dollars 1/	32.2	20.9	53.1
1,000 acres	259.4	100.7	360.1
Constant dollars/acre	124.1	207.2	147.3 2/
1987			
Million dollars 1/	29.5	30.3 3/	59.8 3/
1,000 acres	222.7 4/	134.2	356.9 4/
Constant dollars/acre	132.4 4/	155.7	141.2 4/
1988			
Million dollars 1/	24.1	32.3 5/	56.5 5/
1,000 acres	199.0	138.2	337.2
Constant dollars/acre	121.2	151.2	133.5 5/
1989			
Million dollars 1/	31.9	34.9 5/	66.8
1,000 acres	196.9 6/	146.1	343.0
Constant dollars/acre	162.0	175.2	167.6 2/

1/ All dollars are constant 1989. No General Administration funds included. Does not include funds for nursery and tree improvement.
2/ Weighted average.
3/ Although $30.3 million had been authorized, only $20.9 million were obligated and the cost/acre is based upon the obligated amount. The unspent funds were returned to the K-V trust fund pool for future obligation.
4/ Accomplishments and costs include the $3.4 million and 8,431 acres done with Tongass timber funds.
5/ Although $34.9 million had been authorized, only $25.6 million were obligated. The cost/acre is based upon the obligated amount. The unspent funds were returned to the K-V trust fund pool for future obligation.
6/ Does not include 2.314 acres in Tongass Timber Supply fund.

Table 25–Timber stand improvement program needs--fiscal years 1989-91

	Work needs	Annual program, appropriated funds 1/	
	1,000 acres	*1,000 acres*	*Million dollars*
10/1/88 balance	1,282		
Fiscal year 1989:			
New needs	288		
Projected accomplishments	-345	196.9	31.9
contributed 2/	-3.0		
10/1/89 balance	1,222 3/		
Fiscal year 1990:			
New needs	350		
Projected accomplishments	-353	176.3	18.2
10/1/90 balance	1,219		
Fiscal year 1991:			
New needs	350		
Projected accomplishments	-327		
10/1/91 balance	1,242		

1/ Includes Reforestation Trust Fund pursuant to P.L. 96-451, as amended.
2/ These acres were accomplished on the ground with other contributed funds and are included here to show total acres treated but are not included in other tables.
3/ This represents over 4 years of future accomplishments.

This page was left blank intentionally.

Table 26–Timber stand improvement needs as of October 1, 1989, by State, forest, and cubic foot productivity class

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement Cubic foot productivity classes 2/ 0-49	50-84	85-119	120+	Total	Release subtotal	Thinning subtotal	Fertilization subtotal	Pruning subtotal
				Acres					
Alabama									
NFs in Alabama (subtotal)	0	2,721	2,880	370	5,971	5,773	198	0	0
Alaska									
Chugach	0	0	523	0	523	0	523	0	0
Tongass-Chatham	0	0	693	2,437	3,130	1,812	1,318	0	0
Tongass-Ketchikan	0	0	0	38,018	38,018	1,138	36,880	0	0
Tongass-Stikine	0	10	199	10,547	10,756	0	10,756	0	0
Subtotal	0	10	1,415	51,002	52,427	2,950	49,477	0	0
Arizona									
Apache-Sitgreaves	2,125	3,164	201	0	5,490	0	5,490	0	0
Coconino	15,012	2,605	0	0	17,617	0	17,617	0	0
Kaibab	3,608	3,918	0	0	7,526	0	7,526	0	0
Prescott	162	0	0	0	162	0	162	0	0
Tonto	1,571	241	0	0	1,812	545	1,267	0	0
Subtotal	22,478	9,928	201	0	32,607	545	32,062	0	0
Arkansas									
Ouachita	1,043	11,510	2,196	100	14,849	10,438	4,411	0	0
Ozark-St. Francis	0	2,540	0	0	2,540	200	2,340	0	0
Subtotal	1,043	14,050	2,196	100	17,389	10,638	6,751	0	0
California									
Angeles	0	270	0	0	270	180	60	0	30
Cleveland	334	1,246	0	0	1,580	133	1,447		
Eldorado	0	37	6,014	4,296	10,347	8,410	1,454	483	0
Inyo	0	1,229	152	0	1,381	237	1,144	0	0
Klamath	5,164	19,480	20,520	13,135	58,299	32,535	25,665	99	0
Lake Tahoe Basin	0	0	210	0	210	60	150	0	0
Lassen	0	42,636	12,006	8,419	63,061	6,948	56,113	0	0
Los Padres	185	1,065	175	200	1,625	698	927	0	0
Mendocino	213	8,745	4,991	1,504	15,453	10,492	3,072	1,759	130

See footnotes at end of table.

Table 26–Timber stand improvement needs as of October 1, 1989, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement Cubic foot productivity classes 2/ 0-49	50-84	85-119	120+	Total	Release subtotal	Thinning subtotal	Fertilization subtotal	Pruning subtotal
				Acres					
Modoc	920	13,508	8,128	2,236	24,792	13,910	10,089	793	0
Plumas	113	12,708	10,249	3,219	26,289	9,589	15,645	1,055	0
San Bernardino	375	949	97	0	1,421	902	519	0	0
Sequoia	138	3,269	3,127	2,127	8,661	5,816	2,173	672	0
Shasta	0	6,062	12,936	12,419	31,417	29,118	2,299	0	0
Sierra	0	4,139	1,997	1,462	7,598	3,829	3,769	0	0
Siskiyou	0	0	1,211	0	1,211	994	55	162	0
Six Rivers	0	791	21,996	16,517	39,304	36,060	3,244	0	
Stanislaus	151	2,036	3,875	2,530	8,592	6,587	2,005	0	0
Tahoe	6,518	6,013	5,190	17,305	35,026	25,328	9,698	0	0
Trinity	0	5,949	8,313	7,175	21,437	17,228	4,078	131	0
Toiyabe	2,956	1,643	0	0	4,599	2,462	2,137	0	0
Subtotal	17,067	131,775	121,187	92,544	362,573	211,516	145,743	5,154	160
Colorado									
Arapahoe-Roosevelt	3,822	4,416	0	0	8,238	902	7,336	0	0
Grand Mesa, Uncompahgre, and Gunnison	3,819	720	0	0	4,539	1,408	3,131	0	0
Manti-LaSal	0	0	95	0	95	0	95	0	0
Pike and San Isabel	2,241	297	112	0	2,650	1,510	1,140	0	0
Rio Grande	2,136	19,586	3,368	0	25,090	14,847	10,243	0	0
Routt	5,426	0	0	0	5,426	667	4,759	0	0
San Juan	1,619	1,829	0	0	3,448	3,399	49	0	0
White River	186	399	716	0	1,301	932	369	0	0
Subtotal	19,249	27,247	4,291	0	50,787	23,665	27,122	0	0
Florida									
NFs in Florida (subtotal)	609	988	2,151	106	3,854	403	300	3,151	0
Georgia									
Chattahoochee and Oconee (subtotal)	0	1,600	5,093	1,978	8,671	3,622	5,049	0	0

See footnotes at end of table.

Table 26–Timber stand improvement needs as of October 1, 1989, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement: Cubic foot productivity classes 2/ 0-49	50-84	85-119	120+	Total	Release subtotal	Thinning subtotal	Fertilization subtotal	Pruning subtotal
				Acres					
Idaho									
Boise	625	919	4,591	1,149	7,284	3,991	3,293	0	0
Caribou	0	1,166	70	0	1,236	804	432	0	0
Challis	110	853	0	0	963	134	829	0	0
Clearwater	1,736	62	1,143	3,808	6,749	920	5,829	0	0
Idaho Panhandle	4,109	2,399	9,205	9,393	25,106	7,001	18,048	25	32
Kootenai	116	0	277	283	676	96	580	0	0
Nezperce	253	1,133	1,857	808	4,051	1,197	2,854	0	0
Payette	601	2,977	4,777	383	8,738	1,227	7,511	0	0
Salmon	2,337	1,296	0	0	3,633	2,418	1,215	0	0
Sawtooth	396	24	0	0	420	152	268	0	0
Targhee	0	1,740	0	0	1,740	500	1,240	0	0
Subtotal	10,283	12,569	21,920	15,824	60,596	18,440	42,099	25	32
Illinois									
Shawnee (subtotal)	0	150	140	0	290	227	0	0	63
Indiana									
Hoosier (subtotal)	- 3/	-	-	-	6,149	2,736	1,385	0	2,028
Kentucky									
Daniel Boone (subtotal)	75	2,312	6,075	602	9,064	3,009	5,997	3	55
Louisiana									
Kisatchie (subtotal)	0	160	1,590	1,520	3,270	2,117	1,153	0	0
Maine									
White Mountain (subtotal)	-	-	-	-	189	130	59	0	0
Michigan									
Hiawatha	308	5,010	2,602	28	7,948	1,594	1,142	0	5,212
Huron-Manistee	1,859	3,918	561	0	6,338	3,984	2,354	0	0
Ottawa	94	112	488	30	724	724	0	0	0
Subtotal	2,261	9,040	3,651	58	15,010	6,302	3,496	0	5,212

See footnotes at end of table.

Table 26–Timber stand improvement needs as of October 1, 1989, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement Cubic foot productivity classes 2/ 0-49	50-84	85-119	120+	Total	Release subtotal	Thinning subtotal	Fertilization subtotal	Pruning subtotal
				Acres					
Minnesota									
Chippewa	19	330	401	9	759	329	0	0	430
Superior	4,005	444	161	82	4,692	4,692	0	0	0
Subtotal	4,024	774	562	91	5,451	5,021	0	0	430
Mississippi									
NFs in Mississippi (subtotal)	621	2,210	964	7,728	11,523	7,887	2,341	1,295	0
Missouri									
Mark Twain (subtotal)	1,205	14,851	250	0	16,306	6,642	9,579	0	85
Montana									
Beaverhead	2,510	1,822	170	38	4,540	1,348	3,192	0	0
Bitterroot	2,930	352	1,022	72	4,376	1,550	2,826	0	0
Custer	2,307	5	25	0	2,337	1,189	1,148	0	0
Deerlodge	7,092	3,023	832	0	10,947	1,835	9,112	0	0
Flathead	1,891	3,129	9,092	3,269	17,381	994	16,302	67	18
Gallatin	440	1,614	367	133	2,554	66	2,488	0	0
Helena	1,162	547	548	12	2,269	405	1,854	10	0
Idaho Panhandle	10	0	133	15	158	10	148	0	0
Kootenai	3,017	4,494	14,525	5,893	27,929	744	27,185	0	0
Lewis and Clark	1,201	1,265	799	0	3,265	394	2,871	0	0
Lolo	1,133	2,385	2,432	510	6,460	146	6,307	0	7
Subtotal	23,693	18,636	29,945	9,942	82,216	8,681	73,433	77	25
Nebraska									
Nebraska (subtotal)	0	0	0	0	0	0	0	0	0
New Hampshire									
White Mountain (subtotal)	498	142	261	24	925	589	336	0	0

See footnotes at end of table.

Table 26–Timber stand improvement needs as of October 1, 1989, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement Cubic foot productivity classes 2/ 0-49	50-84	85-119	120+	Total	Release subtotal	Thinning subtotal	Fertilization subtotal	Pruning subtotal
				Acres					
New Mexico									
Carson	3,196	5,222	300	0	8,718	454	8,264	0	0
Cibola	698	5,164	0	0	5,862	698	5,164	0	0
Gila	0	4,643	445	0	5,088	549	4,539	0	0
Lincoln	0	3,822	0	0	3,822	0	3,822	0	0
Santa Fe	0	638	2,616	0	3,254	0	3,254	0	0
Subtotal	3,894	19,489	3,361	0	26,744	1,701	25,043	0	0
New York									
Finger Lakes (subtotal)	0	719	203	0	922	73	849	0	0
North Carolina									
NFs in North Carolina (sub)	99	1,786	1,069	2,535	5,489	4,052	976	461	0
Ohio									
Wayne (subtotal)	-	-	-	-	4,163	1,555	1,261	0	1,347
Oklahoma									
Ouachita (subtotal)	0	724	175	67	966	518	448	0	0
Oregon									
Deschutes	10,164	9,114	7,561	65	26,904	592	26,312	0	0
Fremont	14,282	3,197	2,252	0	19,731	8,438	11,293	0	0
Klamath	0	0	222	1,118	1,340	562	778	0	0
Malheur	5,209	10,650	0	0	15,859	537	15,322	0	0
Mt. Hood	100	4,312	8,999	1,789	15,200	764	7,495	6,920	21
Ochoco	11,880	1,171	0	0	13,051	335	12,716	0	0
Rogue River	0	992	12,220	1,111	14,323	11,209	1,717	1,397	0
Siskiyou	0	2,010	28,687	5,862	36,559	20,192	10,664	5,703	0
Siuslaw	0	0	0	9,140	9,140	4,887	3,208	800	245
Umatilla	774	893	100	0	1,767	155	1,512	0	100
Umpqua	0	769	34,822	5,345	40,936	2,878	12,815	25,243	0
Wallowa-Whitman	2,513	8,805	1,305	0	12,623	3,864	8,759	0	0

See footnotes at end of table.

Table 26–Timber stand improvement needs as of October 1, 1989, by State, forest, and cubic foot productivity class–Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement Cubic foot productivity classes 2/ 0-49	50-84	85-119	120+	Total	Release subtotal	Thinning subtotal	Fertilization subtotal	Pruning subtotal
				Acres					
Willamette	0	1,726	12,358	23,040	37,124	4,336	14,670	17,726	392
Winema	10,943	8,261	0	2	19,206	1,750	17,456	0	0
Subtotal	55,865	51,900	108,526	47,472	263,763	60,499	144,717	57,789	758
Puerto Rico									
Caribbean (subtotal)	0	300	1,100	0	1,400	800	600	0	0
South Carolina									
Francis Marion & Sumter (sub)	0	40	2,026	2,670	4,736	953	3,067	716	0
South Dakota									
Black Hills	6,755	4,217	15	0	10,987	0	10,987	0	0
Custer	30	0	0	0	30	0	30	0	0
Subtotal	6,785	4,217	15	0	11,017	0	11,017	0	0
Tennessee									
Cherokee (subtotal)	0	2,745	1,900	2,689	7,334	6,306	1,028	0	0
Texas									
NFs in Texas (subtotal)	0	1,068	2,049	1,711	4,828	3,562	1,266	0	0
Utah									
Ashley	2,762	0	0	0	2,762	0	2,762	0	0
Dixie	3,240	10,549	0	0	13,789	805	12,984	0	0
Fishlake	0	670	0	0	670	670	0	0	0
Manti-LaSal	0	181	1,361	200	1,742	0	1,742	0	0
Uinta	0	0	151	0	151	151	0	0	0
Wasatch-Cache	1,115	885	0	0	2,000	300	1,700	0	0
Subtotal	7,117	12,285	1,512	200	21,114	1,926	19,188	0	0

See footnotes at end of table.

Table 26–Timber stand improvement needs as of October 1, 1989, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement Cubic foot productivity classes 2/ 0-49	50-84	85-119	120+	Total	Release subtotal	Thinning subtotal	Fertilization subtotal	Pruning subtotal
				Acres					
Vermont									
Green Mountain (subtotal)	-	-	-	-	3,122	1,749	1,373	0	0
Virginia									
George Washington	0	19	0	960	979	939	40	0	0
Jefferson	69	898	155	385	1,507	834	663	0	10
Subtotal	69	917	155	1,345	2,486	1,773	703	0	10
Washington									
Colville	252	1,077	2,693	0	4,022	1,747	2,275	0	0
Gifford Pinchot	0	16,125	9,271	6,417	31,813	698	28,683	2,432	0
Idaho Panhandle	69	0	693	346	1,108	315	793	0	0
Mt. Baker-Snoqualmie	0	120	3,429	4,772	8,321	481	7,033	807	0
Okanogan	2,733	4,465	769	0	7,967	2,340	5,427	200	0
Olympic	85	725	6,552	1,300	8,662	510	4,996	3,156	0
Umatilla	1,641	1,631	0	0	3,272	0	3,272	0	0
Wenatchee	0	25,526	4,801	3	30,330	5,175	16,753	6,665	1,737
Subtotal	4,780	49,669	28,208	12,838	95,495	11,266	69,232	13,260	1,737
West Virginia									
George Washington	0	0	0	0	0	0	0	0	0
Monongahela	4	19	845	12	880	597	283	0	0
Subtotal	4	19	845	12	880	597	283	0	0

See footnotes at end of table.

Table 26–Timber stand improvement needs as of October 1, 1989, by State, forest, and cubic foot productivity class–Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement Cubic foot productivity classes 2/ 0-49	50-84	85-119	120+	Total	Release subtotal	Thinning subtotal	Fertilization subtotal	Pruning subtotal
				Acres					
Wisconsin									
Chequamegon	-	-	-	-	970	950	20	0	0
Nicolet	-	-	-	-	1,363	663	120	0	580
Subtotal	-	-	-	-	2,333	1,613	140	0	580
Wyoming									
Black Hills	94	178	0	0	272	0	272	0	0
Bighorn	11,948	279	0	0	12,227	1,582	10,645	0	0
Bridger-Teton	130	322	927	0	1,379	0	1,379	0	0
Medicine Bow	5,379	230	0	0	5,609	0	5,609	0	0
Shoshone	354	0	0	0	354	298	56	0	0
Subtotal	17,905	1,009	927	0	19,841	1,880	17,961	0	0
Total	-	-	-	-	1,221,901	421,716	705,732	81,931	12,522

1/ States not listed had no timber stand improvement needs as of October 1, 1989.
2/ Cubic foot productivity class refers to the cubic feet of wood produced per acre per year in a natural unmanaged stand.
3/ Timber stand improvement needs by productivity class are not available for the Chequamegon, Nicolet, Green Mountain, Wayne, Hoosier, and the White Mountain National Forests.

Table 27–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1989

State, Commonwealth, or Territory 1/ National Forest	Reforestation					Timber stand improvement				
	Artificial regeneration		Natural regeneration							
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Total	Release	Thinning	Fertili-zation	Pruning	Total
	Acres									
Alabama										
NFs in Alabama (subtotal)	1,985	0	1,090	0	3,075	670	0	0	0	670
Alaska										
Chugach	112	0	0	150	262	0	0	0	0	0
Tongass-Chatham	72	0	0	2,737	2,809	0	623	0	0	623
Tongass-Ketchikan	193	0	0	3,203	3,396	0	870	0	0	870
Tongass-Stikine	282	0	0	1,128	1,410	0	512	0	0	512
Subtotal	659	0	0	7,218	7,877	0	2,005	0	0	2,005
Arizona										
Apache-Sitgreaves	328	0	0	0	328	0	291	0	0	291
Coconino	1,571	0	0	53	1,624	0	0	0	0	0
Kaibab	1,155	0	0	1,046	2,201	0	600	0	0	600
Tonto	50	0	0	0	50	0	0	0	0	0
Subtotal	3,104	0	0	1,099	4,203	0	891	0	0	891
Arkansas										
Ouachita	13,665	391	853	0	14,909	5,791	822	0	0	6,613
Ozark-St. Francis	849	0	0	0	849	0	0	0	0	0
Subtotal	14,514	391	853	0	15,758	5,791	822	0	0	6,613
California										
Angeles	0	0	0	0	0	435	50	0	68	553
Eldorado	173	0	0	0	173	149	0	0	0	149

See footnotes at end of table.

Table 27–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1989--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation					Timber stand improvement				
	Artificial regeneration		Natural regeneration							
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Total	Release	Thinning	Fertili-zation	Pruning	Total
	Acres									
Klamath	797	0	0	0	797	332	204	0	0	536
Lassen	178	0	0	0	178	148	1,020	0	0	1,168
Los Padres	89	0	0	0	89	0	0	0	0	0
Mendocino	543	0	0	0	543	0	0	0	0	0
Plumas	637	0	0	56	693	0	0	0	0	0
San Bernardino	0	0	0	0	0	3	195	0	0	198
Sequoia	812	0	0	203	1,015	0	0	0	0	0
Shasta	3,035	0	225	0	3,260	1,495	323	0	0	1,818
Sierra	600	0	0	0	600	0	0	0	0	0
Siskiyou	1,097	0	0	0	1,097	0	0	0	0	0
Six Rivers	182	0	0	0	182	0	0	0	0	0
Stanislaus	196	0	0	0	196	512	0	0	0	512
Tahoe	87	0	0	0	87	0	0	0	0	0
Toiyabe	111	0	0	0	111	0	0	0	0	0
Trinity	0	0	0	0	0	1,539	60	0	0	1,599
Subtotal	8,537	0	225	259	9,021	4,613	1,852	0	68	6,533
Colorado										
Arapaho and Roosevelt	0	0	45	13	58	0	20	0	0	20
Grand Mesa, Uncompahgre, and Gunnison	53	0	634	669	1,356	0	0	0	0	0
Pike and San Isabel	208	0	64	341	613	330	274	0	0	604
Rio Grande	115	0	0	0	115	220	0	0	0	220
Routt	126	12	0	7,609	7,747	0	285	0	0	285
San Juan	22	0	34	301	357	0	20	0	0	20
White River	0	0	0	541	541	269	0	0	0	269
Subtotal	524	12	777	9,474	10,787	819	599	0	0	1,418

See footnotes at end of table.

Table 27--Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1989--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation					Timber stand improvement				
	Artificial regeneration		Natural regeneration							
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Total	Release	Thinning	Fertili-zation	Pruning	Total
	Acres									
Florida										
NFs in Florida (subtotal)	3,764	4,020	0	0	7,784	1,162	0	3,557	0	4,719
Georgia										
Chattahoochee-Oconee (subtotal)	3,864	0	400	0	4,264	4,288	0	0	0	4,288
Idaho										
Boise	3,371	0	0	8	3,379	0	139	0	0	139
Caribou	849	0	0	4	853	0	0	0	0	0
Challis	23	69	266		358	0	40	0	0	40
Clearwater	4,052	0	20	127	4,199	256	661	5	0	922
Idaho Panhandle	4,426	0	372	772	5,570	1,160	3,368	151	415	5,094
Kootenai	37	0	0	0	37	0	0	0	0	0
Nezperce	5,094	0	42	1,129	6,265	249	784	12	0	1,045
Payette	1,290	0	250	0	1,540	0	1,182	0	0	1,182
Salmon	164	0	162	0	326	76	0	0	0	76
Sawtooth	511	0	762	0	1,273	0	83	0	0	83
Targhee	99	0	1,019	0	1,118	0	0	0	0	0
Subtotal	19,916	69	2,893	2,040	24,918	1,741	6,257	168	415	8,581
Illinois										
Shawnee (subtotal)	408	0	327	0	735	52	0	0	23	75
Indiana										
Wayne-Hoosier (subtotal)	298	0	905	13	1,216	468	0	0	0	468
Kentucky										
Daniel Boone (subtotal)	852	0	685	0	1,537	614	61	0	0	675

See footnotes at end of table.

Table 27–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1989--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation					Timber stand improvement				
	Artificial regeneration		Natural regeneration							
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Total	Release	Thinning	Fertili-zation	Pruning	Total
	Acres									
Louisiana										
Kisatchie (subtotal)	5,819	0	0	1,701	7,520	357	0	0	0	357
Maine										
White Mountain (subtotal)	0	0	77	0	77	63	0	0	0	63
Michigan										
Hiawatha	616	154	1,849	314	2,933	303	0	0	218	521
Huron-Manistee	1,860	60	3,117	1,050	6,087	1,699	191	0	63	1,953
Ottawa	372	32	2,336	2,440	5,180	1,033	0	0	0	1,033
Subtotal	2,848	246	7,302	3,804	14,200	3,035	191	0	281	3,507
Minnesota										
Chippewa	1,167	11	4,739	386	6,303	1,089	0	0	0	1,089
Superior	3,042	803	1,660	2,012	7,517	1,205	0	0	0	1,205
Subtotal	4,209	814	6,399	2,398	13,820	2,294	0	0	0	2,294
Mississippi										
NFs in Mississippi (sub)	13,665	22	856	113	14,656	5,869	1,005	0	0	6,874
Missouri										
Mark Twain (subtotal)	1,882	149	7,330	0	9,361	2,603	879	0	0	3,482
Montana										
Beaverhead	984	0	650	1,204	2,838	20	449	0	0	469
Bitterroot	3,856	0	1	92	3,949	462	772	0	0	1,234
Custer	0	0	0	0	0	268	372	0	0	640
Deerlodge	374	0	183	215	772	686	508	0	0	1,194
Flathead	1,684	0	756	285	2,725	2,456	997	0	0	3,453

See footnotes at end of table.

Table 27–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1989–Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation					Timber stand improvement				
	Artificial regeneration		Natural regeneration							
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Total	Release	Thinning	Fertili-zation	Pruning	Total
	Acres									
Gallatin	3,024	0	95	653	3,772	0	743	0	0	743
Helena	2,524	0	183	353	3,060	34	293	0	0	327
Kootenai	6,488	0	2,561	2,338	11,387	173	4,722	0	0	4,895
Lewis and Clark	295	0	218	250	763	200	314	0	0	514
Lolo	4,975	89	1,408	1,211	7,683	0	827	0	0	827
Subtotal	24,204	89	6,055	6,601	36,949	4,299	9,997	0	0	14,296
New Hampshire										
White Mountain (subtotal)	28	0	1,379	16	1,423	339	0	0	0	339
New Mexico										
Carson	1,222	0	0	0	1,222	99	519	0	0	618
Gila	191	0	0	0	191	0	0	0	0	0
Lincoln	0	0	0	0	0	0	632	0	0	632
Santa Fe	226	0	0	8	234	0	2,088	0	0	2,088
Subtotal	1,639	0	0	8	1,647	99	3,239	0	0	3,338
New York										
Green Mountain (subtotal)	0	0	55	0	55	0	26	0	0	26
North Carolina										
NFs in North Carolina (sub)	2,268	0	3,467	0	5,735	991	100	0	0	1,091
Ohio										
Wayne-Hoosier (subtotal)	179	0	1,022	0	1,201	183	0	0	0	183
Oklahoma										
Ouachita (subtotal)	1,130	0	0	0	1,130	140	137	0	0	277

See footnotes at end of table.

Table 27–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest–fiscal year 1989–Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation					Timber stand improvement				
	Artificial regeneration		Natural regeneration							
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Total	Release	Thinning	Fertili-zation	Pruning	Total
	Acres									
Oregon										
Deschutes	7,940	0	4,326	0	12,266	153	14,703	0	0	14,856
Fremont	770	0	249	502	1,521	0	0	0	0	0
Klamath	153	0	0	0	153	0	0	0	0	0
Malheur	820	0	262	10	1,092	0	3,104	0	0	3,104
Mt. Hood	2,221	0	0	139	2,360	0	2,332	7,553	0	9,885
Ochoco	1,122	0	0	0	1,122	0	0	0	0	0
Rogue River	7,446	0	0	0	7,446	282	546	0	0	828
Siskiyou	4,405	0	0	93	4,498	1,391	1,282	1,240	0	3,913
Siuslaw	2,486	0	0	0	2,486	4,555	1,212	538	42	6,347
Umatilla	2,078	0	922	1,992	4,992	0	0	0	0	0
Umpqua	3,815	0	95	0	3,910	10	3,137	1,731	0	4,878
Wallowa-Whitman	966	0	5	1,822	2,793	316	1,164	0	0	1,480
Willamette	7,236	0	0	21	7,257	631	7,366	2,674	121	10,792
Winema	1,008	0	0	0	1,008	300	2,168	0	0	2,468
Subtotal	42,466	0	5,859	4,579	52,904	7,638	37,014	13,736	163	58,551
Pennsylvania										
Allegheny (subtotal)	0	0	1,574	436	2,010	0	0	0	0	0
South Carolina										
Francis Marion and Sumter (subtotal)	4,243	0	111	17	4,371	1,192	455	1,116	0	2,763
South Dakota										
Black Hills	0	0	20	3,232	3,252	0	9,350	0	0	9,350
Custer	0	0	0	0	0	35	0	0	0	35
Subtotal	0	0	20	3,232	3,252	35	9,350	0	0	9,385

See footnotes at end of table.

Table 27–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1989--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation					Timber stand improvement				
	Artificial regeneration		Natural regeneration							
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Total	Release	Thinning	Fertili-zation	Pruning	Total
	Acres									
Tennessee										
Cherokee (subtotal)	1,066	0	415	283	1,764	2,734	0	0	0	2,734
Texas										
NFs in Texas (subtotal)	3,264	0	637	849	4,750	405	349	0	0	754
Utah										
Ashley	0	0	732	0	732	0	0	0	0	0
Fishlake	0	0	0	0	0	172	0	0	0	172
Subtotal	0	0	732	0	732	172	0	0	0	172
Vermont										
Green Mountain (subtotal)	28	0	424	82	534	77	3	0	0	80
Virginia										
George Washington	118	0	1,645	0	1,763	756	0	0	0	756
Jefferson	772	0	1,500	0	2,272	1,057	1,320	0	0	2,377
Subtotal	890	0	3,145	0	4,035	1,813	1,320	0	0	3,133
Washington										
Colville	731	0	836	128	1,695	0	729	0	0	729
Gifford Pinchot	5,886	0	138	258	6,282	70	3,204	918	0	4,192
Idaho Panhandle	290	0	0	7	297	21	24	0	0	45
Mt. Baker-Snoqualmie	3,447	0	0	843	4,290	41	1,475	1,150	0	2,666
Okanogan	769	0	835	126	1,730	0	0	0	0	0

See footnotes at end of table.

Table 27–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1989--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation					Timber stand improvement				
	Artificial regeneration		Natural regeneration							
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Total	Release	Thinning	Fertili-zation	Pruning	Total
	Acres									
Olympic	3,873	0	0	664	4,537	223	960	2,200	0	3,383
Umatilla	351	0	41	0	392	0	603	0	0	603
Wenatchee	0	0	0	0	0	0	0	1,021	0	1,021
Subtotal	15,347	0	1,850	2,026	19,223	355	6,995	5,289	0	12,639
West Virginia										
George Washington	0	0	95	0	95	234	0	0	0	234
Monongahela	22	0	761	299	1,082	234	98	0	0	332
Subtotal	22	0	856	299	1,177	468	98	0	0	566
Wisconsin										
Chequamegon	1,241	0	4,289	278	5,808	891	0	0	0	891
Nicolet	794	0	3,170	3,877	7,841	668	0	0	0	668
Subtotal	2,035	0	7,459	4,155	13,649	1,559	0	0	0	1,559

See footnotes at end of table.

Table 27–Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1989--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation					Timber stand improvement				
	Artificial regeneration		Natural regeneration							
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Total	Release	Thinning	Fertili-zation	Pruning	Total
	Acres									
Wyoming										
Big Horn	0	0	0	115	115	0	0	0	0	0
Black Hills	0	0	0	0	0	0	377	0	0	377
Medicine Bow	0	0	484	0	484	923	997	0	0	1,920
Shoshone	0	0	0	2,672	2,672	235	293	0	0	528
Targhee	269	0	142	0	411	0	0	0	0	0
Subtotal	269	0	626	2,787	3,682	1,158	1,667	0	0	2,825
Total	185,926	5,812	65,805	53,489	311,032	58,096	85,312	23,866	950	168,224

1/ States not listed had no certification in fiscal year 1989.
2/ w/ site prep. = with site preparation; w/o site prep. = without site preparation.

Table 28–Certification of reforestation and timber stand improvement acreages by Region--fiscal year 1989

Region	Reforestation					Timber stand improvement				
			Natural regeneration							
	Planted	Seeded	With site preparation	Without site preparation	Total	Release	Precom-mercial thinning	Fertili-zation	Pruning	Total
					Acres					
Northern	38,103	89	6,489	8,636	53,317	6,020	14,834	168	415	21,437
Rocky Mountain	524	12	1,281	15,493	17,310	1,977	11,616	-	-	13,593
Southwest	4,743	-	-	1,107	5,850	99	4,130	-	-	4,229
Intermountain	6,687	69	3,333	12	10,101	248	1,444	-	-	1,692
Pacific Southwest	7,482	-	225	259	7,966	4,613	1,852	-	68	6,533
Pacific Northwest	58,467	-	7,709	6,598	72,774	7,972	43,985	19,025	163	71,145
Southern	57,324	4,433	11,754	2,963	76,474	26,260	4,249	4,673	-	35,182
Eastern	11,937	1,209	35,014	11,203	59,363	10,907	1,197	-	304	12,408
Alaska	659	-	-	7,218	7,877	-	2,005	-	-	2,005
Total	185,926	5,812	65,805	53,489	311,032	58,096	85,312	23,866	950	168,224

This page was left blank intentionally.

Table 29–Total recreation use on National Forest System lands by State--fiscal years 1985-89

State, Comonwealth, or Territory 1/	1989	1988	1987	1986	1985
			1,000 RVD's 2/		
Alabama	685.5	741.4	850.4	771.0	871.9
Alaska	4,636.2	4,354.5	4,085.3	3,584.6	4,851.7
Arizona	18,997.5	18,831.2	18,839.8	17,451.6	14,664.1
Arkansas	2,377.0	2,358.5	2,278.7	2,213.7	2,206.0
California	63,685.3	59,516.9	57,975.4	55,745.9	55,314.3
Colorado	23,238.2	21,484.0	22,583.3	20,158.7	21,115.7
Florida	2,851.5	2,787.5	2,731.5	2,637.2	2,532.9
Georgia	2,715.1	2,707.0	2,669.4	2,314.5	2,304.0
Idaho	11,738.3	10,736.3	10,806.5	10,342.1	10,220.7
Illinois	950.1	891.5	830.0	972.6	972.7
Indiana	587.6	430.1	483.2	425.1	393.1
Kansas	48.0	38.2	21.8	21.0	19.2
Kentucky	2,327.0	2,301.3	2,248.7	2,162.9	2,152.5
Louisiana	512.7	502.3	418.1	475.7	430.8
Maine	52.8	47.6	47.6	46.1	47.5
Michigan	4,725.4	4,319.6	4,409.8	4,196.7	4,133.6
Minnesota	5,147.6	4,449.6	4,382.3	4,297.5	4,391.9
Mississippi	1,236.9	1,240.4	1,179.5	1,128.3	1,115.8
Missouri	1,704.8	1,705.0	1,716.4	1,693.6	1,761.4
Montana	9,412.5	8,843.7	9,912.3	8,899.8	10,020.7
Nebraska	142.0	181.1	163.0	106.8	115.1
Nevada	3,081.5	2,656.8	2,353.8	2,148.6	2,074.1
New Hampshire	2,683.7	2,783.0	2,474.1	2,259.5	2,374.9
New Mexico	7,465.6	7,227.5	6,446.6	6,015.5	6,975.7
New York	22.4	25.6	22.8	23.2	22.9
North Carolina	5,036.2	4,973.2	4,572.1	4,258.1	3,667.7
North Dakota	184.3	186.7	131.3	142.0	135.5
Ohio	429.5	410.7	411.7	381.0	375.6
Oklahoma	341.4	331.4	320.6	357.0	377.2
Oregon	18,231.1	19,598.1	19,210.1	19,294.9	19,060.6
Pennsylvania	2,605.1	2,621.4	2,394.1	2,067.6	1,948.9
Puerto Rico	396.0	399.7	382.2	539.1	468.5
South Carolina	974.5	916.5	920.0	845.1	919.3
South Dakota	2,737.3	2,734.9	2,687.4	2,692.4	3,495.4
Tennessee	2,655.3	2,561.7	2,432.2	2,170.4	2,107.2
Texas	2,057.1	1,863.6	1,923.9	1,958.7	1,623.1
Utah	13,312.8	14,454.8	13,736.9	13,179.4	13,914.3
Vermont	1,352.3	1,154.1	1,029.1	11,142.9	850.5
Virginia	3,946.3	3,804.0	3,726.4	3,498.7	3,511.2
Washinton	18,017.7	15,477.6	15,058.3	14,863.9	12,690.2
West Virginia	1,146.3	1,152.1	1,137.2	1,265.6	1,334.0
Wisconsin	1,978.6	2,000.1	1,952.5	1,909.8	1,942.8
Wyoming	6,068.0	6,514.5	6,502.0	5,873.9	5,902.1
Total	252,495.0	242,315.7	238,458.3	236,532.7	225,407.3

1/ States not listed have no Forest Service recreation program.

2/ One recreation visitor-day (RVD) is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table 30–State summary of total recreation use on National Forest System lands by activity--fiscal year 1989

State, Commonwealth, or Territory 1/	Camping, picnicking & swimming	Mechanized travel & viewing scenery	Hiking, horseback riding & water travel	Winter sports	Resorts, cabins & organization camps
			1,000 RVD's 2/		
Alabama	220.0	102.6	58.7	0.0	0.4
Alaska	295.2	2,985.3	343.3	123.4	136.1
Arizona	5,969.4	7,780.5	1,477.6	214.8	858.8
Arkansas	692.8	527.7	175.8	0.0	17.4
California	17,824.3	23,888.4	3,991.0	3,996.5	6,661.0
Colorado	5,293.8	6,948.9	1,742.7	5,547.2	604.8
Florida	1,571.8	423.9	163.4	0.0	210.0
Georgia	795.4	820.8	317.0	1.8	45.1
Idaho	3,410.3	3,300.1	1,054.8	721.4	565.8
Illinois	223.1	336.8	139.1	0.8	6.2
Indiana	245.4	58.2	57.0	0.0	0.0
Kansas	12.4	19.7	1.5	0.0	0.0
Kentucky	632.8	754.6	319.4	1.6	17.1
Louisiana	161.5	132.6	10.4	0.0	32.6
Maine	18.1	6.8	9.9	0.7	2.0
Michigan	1,221.8	1,720.3	325.5	67.3	106.0
Minnesota	1,551.3	987.2	571.5	142.3	516.6
Mississippi	307.5	250.1	108.7	0.0	5.2
Missouri	503.5	487.5	212.6	0.0	10.7
Montana	2,014.9	2,772.7	1,223.9	578.2	315.4
Nebraska	40.6	26.4	15.6	0.1	32.0
Nevada	1,017.6	819.7	306.0	301.9	135.1
New Hampshire	693.0	805.7	462.4	544.3	82.8
New Mexico	2,554.6	1,699.5	705.7	596.5	243.2
New York	9.4	1.1	3.1	1.2	0.0
North Carolina	1,291.8	1,723.0	734.6	9.7	64.2
North Dakota	19.8	46.8	11.8	1.5	0.6
Ohio	83.2	109.9	56.2	1.1	0.0
Oklahoma	58.3	153.0	28.5	0.2	0.0
Oregon	6,401.3	4,943.1	1,338.8	980.3	1,286.7
Pennsylvania	799.0	1,056.8	228.1	9.5	84.0
Puerto Rico	157.0	129.0	38.0	0.0	13.5
South Carolina	250.7	285.0	139.7	0.0	2.4
South Dakota	206.7	1,996.3	108.4	14.4	115.1
Tennessee	1,044.2	747.6	282.8	2.2	96.5
Texas	546.1	324.2	76.0	0.0	15.4
Utah	4,863.8	3,344.3	1,267.7	911.0	645.4
Vermont	96.9	193.1	59.8	805.5	39.1
Virginia	1,004.9	1,158.6	386.8	14.6	20.2
Washington	5,671.7	5,047.2	1,669.0	1,391.4	1,100.5
West Virginia	458.0	176.2	96.5	2.8	31.0
Wisconsin	550.7	563.9	84.9	17.1	23.0
Wyoming	1,478.5	1,610.6	873.2	368.0	539.6
Total	72,263.1	81,265.7	21,277.4	17,369.3	14,681.5

1/ States not listed have no Forest Service recreation program.

2/ One recreation visitor-day (RVD) is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table 30–State summary of total recreation use on National Forest System lands by activity--fiscal year 1989--Continued

Hunting	Fishing	Nature studies	Other recreation activities	Total	State, Commonwealth, or Territory 1/
		1,000 RVD's 2/			
168.4	70.2	7.9	57.3	685.5	Alabama
126.6	417.7	41.9	166.7	4,636.2	Alaska
757.9	879.4	99.0	960.1	18,997.5	Arizona
508.5	307.3	24.5	123.0	2,377.0	Arkansas
1,483.6	3,085.4	382.3	2,372.8	63,685.3	California
1,119.8	1,279.3	72.4	629.3	23,238.2	Colorado
203.2	160.9	18.6	99.7	2,851.5	Florida
395.5	225.2	32.3	82.0	2,715.1	Georgia
924.6	905.7	83.4	772.2	11,738.3	Idaho
121.0	50.7	20.7	51.7	950.1	Illinois
110.1	100.0	3.1	13.8	587.6	Indiana
6.7	3.2	2.5	2.0	48.0	Kansas
183.7	276.8	30.7	110.3	2,327.0	Kentucky
107.9	28.8	2.1	36.8	512.7	Louisiana
8.5	4.2	1.4	1.2	52.8	Maine
576.8	488.2	20.3	199.2	4,725.4	Michigan
344.6	815.4	17.8	200.9	5,147.6	Minnesota
399.8	84.7	20.2	60.7	1,236.9	Mississippi
276.3	106.2	18.0	90.0	1,704.8	Missouri
968.1	715.8	71.3	752.2	9,412.5	Montana
6.8	1.5	1.0	18.0	142.0	Nebraska
193.1	95.1	65.1	147.9	3,081.5	Nevada
33.5	26.4	12.0	23.6	2,683.7	New Hampshire
581.5	342.6	86.6	655.4	7,465.6	New Mexico
4.5	1.4	0.3	1.4	22.4	New York
702.6	267.7	68.1	174.5	5,036.2	North Carolina
96.0	2.4	0.7	4.7	184.3	North Dakota
124.9	3.5	22.5	28.2	429.5	Ohio
63.5	19.4	1.6	16.9	341.4	Oklahoma
874.8	926.3	119.2	1,360.6	18,231.1	Oregon
197.0	151.0	18.3	61.4	2,605.1	Pennsylvania
0.0	0.0	2.0	56.5	396.0	Puerto Rico
170.8	45.1	12.3	68.5	974.5	South Carolina
123.9	61.6	14.3	96.6	2,737.3	South Dakota
225.7	176.0	25.6	54.7	2,655.3	Tennessee
242.1	803.6	11.4	38.3	2,057.1	Texas
873.4	823.3	104.2	479.7	13,312.8	Utah
53.1	9.5	53.0	42.3	1,352.3	Vermont
795.2	324.3	47.1	194.6	3,946.3	Virginia
937.3	714.4	83.8	1,402.4	18,017.7	Washington
205.2	116.9	4.7	55.0	1,146.3	West Virginia
219.8	395.4	53.2	70.6	1,978.6	Wisconsin
536.6	404.0	37.1	220.4	6,068.0	Wyoming
16,052.9	15,716.5	1,814.5	12,054.1	252,495.0	Total

Table 31–Trail miles on the National Forest System by State--fiscal years 1987-89 1/

State, Commonwealth, or Territory 2/	1989			1988			1987		
	Total	Constructed 3/	Maintained	Total	Constructed 3/	Maintained	Total	Constructed 3/	Maintained
Alabama	216	14	185	244	8	138	236	7	117
Alaska	804	36	428	948	12	354	656	28	629
Arizona	3,745	131	563	3,899	44	360	3,817	22	333
Arkansas	465	14	465	518	15	332	400	12	150
California	13,295	192	8,121	12,443	189	5,204	11,839	222	6,493
Colorado	7,801	388	4,784	8,734	221	2,784	8,288	97	4,135
Florida	350	1	204	269	2	180	267	0	162
Georgia	500	11	496	535	8	458	527	7	231
Idaho	14,119	149	5,956	16,931	152	7,508	16,316	108	8,238
Illinois	187	0	47	206	0	206	205	0	205
Indiana	160	4	160	120	0	80	120	0	62
Kansas	31	0	9	0	0	0	0	0	0
Kentucky	505	8	276	544	4	266	542	4	187
Louisiana	128	10	122	127	0	69	127	13	88
Maine	171	0	0	116	4	116	108	0	108
Michigan	2,254	88	2,199	2,461	93	1,713	2,091	46	1,776
Minnesota	2,740	33	2,740	2,698	45	2,645	2,651	4	2,647
Mississippi	238	21	238	396	4	127	392	6	104
Missouri	1,283	21	995	623	14	537	603	0	568
Montana	15,456	132	9,585	12,820	93	4,676	12,820	68	6,488
Nebraska	58	0	0	52	2	1	39	1	22
Nevada	1,901	20	676	1,647	1	481	1,523	5	315
New Hampshire	1,258	10	0	1,283	47	1,083	1,275	5	1,275
New Mexico	3,832	31	714	3,654	28	1,596	3,511	12	964
New York	29	1	25	32	7	32	25	0	25
North Carolina	1,457	16	713	1,408	26	810	1,463	8	777
North Dakota	29	29	26	0	0	0	0	0	0
Ohio	185	19	185	134	35	75	122	12	99
Oklahoma	167	0	78	82	0	30	82	0	30
Oregon	8,687	112	6,033	8,807	293	5,284	8,514	99	5,028
Pennsylvania	636	11	636	428	15	428	428	75	355
Puerto Rico	20	1	20	21	1	21	31	1	25
South Carolina	381	7	266	533	15	212	520	12	180

See footnotes at end of table

Table 31–Trail miles on the National Forest System by State--fiscal years 1987-89--Continued

State, Commonwealth, or Territory 2/	1989			1988			1987		
	Total	Constructed 3/	Maintained	Total	Constructed 3/	Maintained	Total	Constructed 3/	Maintained
South Dakota	193	30	94	176	13	10	138	3	123
Tennessee	637	7	385	592	15	582	582	6	161
Texas	283	0	168	208	15	161	193	10	190
Utah	4,339	84	2,393	5,075	75	2,203	5,060	24	2,143
Vermont	965	13	200	670	23	670	594	6	550
Virginia	1,860	11	974	1,871	14	1,039	1,867	12	393
Washington	8,001	190	5,925	7,239	197	4,488	7,042	65	4,431
West Virginia	815	57	334	863	69	269	837	0	233
Wisconsin	1,963	12	1,114	1,348	7	1,056	1,343	7	1,343
Wyoming	6,237	30	2,585	6,079	28	2,121	5,313	39	2,303
Total	108,381	1,944	61,117	106,834	1,834	50,405	102,507	1,046	53,686

1/ Includes work accomplished by Human Resource Programs and volunteers.
2/ States not listed have no Forest Service recreation program.
3/ Miles constructed include construction of new trails and reconstruction of existing trails. The predominant activity is reconstruction.

Table 32–Acres of the National Wilderness Preservation System by State-- calendar years 1985-89 1/

State, Comonwealth, or Territory 2/	1989	1988	1987	1986	1985
				1,000 acres 3/	
Alabama	33	33	19	19	19
Alaska	5,453	5,453	5,453	5,453	5,453
Arizona	1,345	1,338	1,316	1,316	1,320
Arkansas	115	115	115	116	116
California	3,921	3,921	3,922	3,920	3,920
Colorado	2,587	2,587	2,587	2,584	2,586
Florida	73	73	73	73	73
Georgia	89	89	89	89	47
Idaho	3,960	3,960	3,960	3,957	3,827
Indiana	13	13	13	13	13
Kentucky	17	17	17	18	18
Louisiana	9	9	9	9	9
Michigan	92	92	92	0	0
Minnesota	799	798	798	798	798
Mississippi	6	6	6	5	5
Missouri	63	63	63	63	63
Montana	3,372	3,372	3,372	3,371	3,366
Nebraska	8	8	8	8	0
Nevada	65	65	65	65	65
New Hampshire	103	103	103	103	103
New Mexico	1,388	1,388	1,388	1,391	1,387
North Carolina	101	101	101	101	100
Oklahoma	14	14	0	0	0
Oregon	2,079	2,078	2,078	2,078	2,077
Pennsylvania	9	9	9	10	10
South Carolina	17	17	17	17	17
South Dakota	10	10	10	10	10
Tennessee	67	67	67	67	33
Texas	36	36	36	35	34
Utah	774	775	775	780	780
Vermont	59	59	59	59	59
Virginia	89	90	65	65	65
Washington	2,571	2,571	2,571	2,573	2,521
West Virginia	81	81	78	78	78
Wisconsin	42	42	42	44	44
Wyoming	3,080	3,081	3,081	3,081	3,086
Total	32,540	32,534	32,457	32,369	32,102

1/ Includes all changes to the Wilderness Preservation System through the 100th Congress.
2/ States not listed have no National Forest System acres in the National Wilderness Preservation System.
3/ Acreage for most states is estimated pending final map compilation; therefore, minor changes may occur between years.

Table 33–Additions to the National Wilderness Preservation System--fiscal year 1989 1/

Public Law	State	Date	Number of new areas	Number of additions	Number of adjustments	Acres
Total			0	0	0	0

1/ No new legislation in fiscal year 1989.

Table 34–Additions to the National Wild and Scenic Rivers System--fiscal year 1989 1/

River	State	Date	Miles
Total			0

1/ No new additions in fiscal year 1989.

Table 35–Wildlife and fish habitat improvement by Region--fiscal year 1989 1/

Region	Wildlife	Resident & anadromous fish	Threatened, endangered & sensitive species	Total
Northern				
Acres	23,755	701	1,238	25,694
Structures	715	884	60	1,659
Rocky Mountain				
Acres	27,963	625	164	28,752
Structures	1,146	1,101	106	2,353
Southwestern				
Acres	32,219	18	14,190	46,427
Structures	394	281	140	815
Intermountain				
Acres	20,533	404	166	21,103
Structures	691	1,138	362	2,191
Pacific Southwest				
Acres	9,508	516	62,763	72,787
Structures	1,316	642	141	2,099
Pacific Northwest				
Acres	16,554	266	232	17,052
Structures	12,024	3,668	86	15,778
Southern				
Acres	162,047	3,512	41,974	207,533
Structures	2,794	1,266	403	4,463
Eastern				
Acres	27,497	4,625	3,722	35,844
Structures	2,955	1,972	471	5,398
Alaska				
Acres	6,181	1,328	0	7,509
Structures	130	62	0	192
Total				
Acres	326,257	11,995	124,449	462,701
Structures	22,165	11,014	1,769	34,948

1/ Does not include activities that are accomplished in support of other resource programs.

Table 36–Range allotment management status by Region--fiscal year 1989

Region	Number of allotments			Acres	
	Total	Improved management started	Improved management maintained	Total	Suitable 1/
Northern	1,710	3	1,313	11,152,259	4,083,055
Rocky Mountain	2,470	81	1,665	18,810,916	8,375,255
Southwestern	1,421	53	1,088	21,878,612	13,193,712
Intermountain	1,722	1	1,324	26,817,298	11,378,698
Pacific Southwest	826	17	509	11,679,823	4,649,063
Pacific Northwest	804	15	538	11,743,603	7,219,517
Southern	595	2	448	1,707,679	1,225,926
Eastern	204	28	165	95,645	47,129
Total	9,752	200	7,050	103,885,835 2/	50,172,355 2/

1/ Suitable acres are acres accessible to livestock and which can be grazed on a sustained yield basis without damage to the resource.
2/ FY 1988 data.

Table 37—Range allotment management status--fiscal years 1985-89

	Unit of measure	1989	1988	1987	1986	1985
Total allotments 1/	Allotments	9,752	9,868	9,610	9,658	10,223
Improved management started	Allotments	200	195	225	338	351
Improved management maintained	Allotments	7,050	7,473	7,335	7,503	7,237
Total acres	MM acres	104	104	100	103	105
Suitable acres	MM acres	50	50	50	50	50
Permitted use 2/	MM AUM's	9.6	9.9	9.9	10.1	10.1
Actual use	MM AUM's	7.8	8.4	8.4	8.7	8.8

1/ Does not include vacant allotments.
2/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow or the equivalent for 1 month.

Table 38–Actual grazing use in AUM's by State--fiscal year 1989 1/

State, Commonwealth, or Territory 2/	Cattle	Sheep	Domestic horses	Wild horses	Wild burros	Total
Alabama	2,447	0	48	0	0	2,495
Arizona	1,196,188	21,269	5,468	0	0	1,222,925
Arkansas	28,164	0	72	0	0	28,236
California	461,288	48,018	16,695	6,363	781	533,145
Colorado	781,001	139,811	18,082	0	0	938,894
Florida	21,383	0	0	0	0	21,383
Georgia	4,394	0	0	0	0	4,394
Idaho	559,830	160,217	15,591	0	0	735,638
Illinois	15,881	3,370	58	0	0	19,309
Kansas	35,941	0	53	0	0	35,994
Kentucky	250	0	0	0	0	250
Louisiana	21,988	0	0	0	0	21,988
Michigan	1,319	0	0	0	0	1,319
Minnesota	522	0	0	0	0	522
Mississippi	4,930	0	0	0	0	4,930
Missouri	31,431	0	10	0	0	31,441
Montana	482,818	17,687	16,461	0	0	516,966
Nebraska	119,537	0	149	0	0	119,686
Nevada	224,308	50,907	1,913	4,579	0	281,707
New Mexico	704,179	14,888	7,873	672	0	727,612
New York	7,466	0	58	0	0	7,524
North Dakota	418,356	238	3,558	0	0	422,152
Ohio	848	0	7	0	0	855
Oklahoma	24,894	912	33	0	0	25,839
Oregon	435,580	24,939	2,672	1,080	29	464,300
South Carolina 3/	0	0	0	0	0	0
South Dakota	437,646	6,057	389	0	0	444,092
Texas	64,311	0	76	0	0	64,387
Utah	454,531	207,738	1,468	1	0	663,738
Vermont	232	0	0	0	0	232
Virginia	1,268	0	0	0	0	1,268
Washington	89,215	18,059	3,688	0	0	110,962
West Virginia	8,394	186	26	0	0	8,606
Wisconsin	43	0	0	0	0	43
Wyoming	487,273	111,119	11,980	0	0	610,372
Total	7,127,856	825,415	106,428	12,695	810	8,073,204

1/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow, or the equivalent for 1 month.
2/ States not listed had no Forest Service grazing program in 1989.
3/ Data not available.

Table 39–Annual grazing statistics--fiscal year 1989

	Permittees	Cattle		Horses and burros		Sheep and goats		Total	
		Number	*AUM's 1/*	*Number*	*AUM's*	*Number*	*AUM's*	*Number*	*AUM's*
Permitted to graze		1,353,837	8,423,525	72,530	100,548	1,285,498	1,041,509	2,711,865	9,565,582
Actually grazed:									
Paid permits	11,983 2/	1,210,997	7,103,821	13,877	45,490	1,052,828	820,938	2,277,702	7,970,249
Free use:									
Recreation stock	39,434	16	182	79,336	51,828			79,352	52,010
Other free use	138	1,860	19,135	973	9,058	1,066	3,488	3,899	31,681
Private land permits 3/	(453)	(47,361)	(404,370)	(396)	(6,388)	(17,715)	(16,043)	(65,472)	(426,801)
Crossing	34	12,132	2,995	264	30	20,213	811	32,609	3,836
Unauthorized use	24	1,234	1,723	15	22	2,445	178	3,694	1,923
Total 3/	51,613	1,226,239	7,127,856	94,465	106,428	1,076,552	825,415	2,397,256	8,059,699
Wild horses				1,061	12,695			1,061	12,695
Wild burros				160	810			160	810
Total actually grazed 3/	51,613	1,226,239	7,127,856	95,686	119,933	1,076,552	825,415	2,398,477	8,073,204

1/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow, or the equivalent for 1 month.
2/ Includes term and temporary grazing permits and all other paid permits (e.g., transportation, research, working animals, special uses, etc.).
3/ Private land permit data not included in totals.

Table 40–Range improvements by type--fiscal year 1989

Improvement type	Units of measure	Units of construction completed	Total cost
			Actual dollars 2/
Structural:			
Water developments	Sites	2,699	2,214,838
Range fence	Miles	1,307	3,507,513
Pipeline	Miles	217	1,374,626
Other structural facilities	Sites	259	750,230
Subtotal		- 1/	7,847,207
Nonstructural:			
Cover manipulation, brush	Acres	51,117	631,885
Range plant control	Acres	7,043	345,782
Forage improvement	Acres	45,570	855,794
Noxious farm weed control	Acres	23,861	1,418,611
Subtotal		127,591	3,252,072
Total		- 1/	11,099,279

1/ -- = not applicable.
2/ Actual dollars include appropriated funds, other public funds, conservation practices, and cooperative funds.

Table 41–Road and bridge construction and reconstruction by State--fiscal year 1989

State, Commonwealth, or Territory 2/	From Appropriated Funds 1/							
	Construction				Reconstruction			
	Roads		Bridges		Roads		Bridges	
	Miles	Cost	No.	Cost	Miles	Cost	No.	Cost
		1000 dollars		*1000 dollars*		*1000 dollars*		*1000 dollars*
Alabama	0.0	127.2	0	0.0	5.2	995.2	3	216.3
Alaska	3.5	708.5 4/	0	0.0 4/	2.7	841.0	0	0.0
Arizona	2.8	472.2	0	0.0	16.8	5,280.2	0	0.0
Arkansas	0.4	803.7	0	0.0	4.8	1,262.8	0	22.1
California	15.4	9,502.2	1	475.5	58.5	7,763.6	0	5.3
Colorado	8.5	3,167.8	0	0.0	56.4	3,002.9	1	72.9
Florida	0.0	8.1	0	0.0	0.0	655.7	0	0.0
Georgia	0.4	991.4	0	0.1	15.6	1,425.2	3	138.7
Idaho	10.9	6,622.3	4	232.6	92.9	7,521.1	5	255.4
Illinois	0.0	0.0	0	0.0	4.8	414.3	3	255.9
Indiana	0.0	0.0	0	0.0	0.6	228.9	0	0.0
Kentucky	2.9	354.4	0	0.0	11.9	1,655.6	0	0.0
Louisiana	0.0	41.4	0	0.0	13.8	1,152.5	0	1.7
Maine	0.0	11.0	0	0.0	0.0	28.0	0	0.0
Michigan	4.4	660.8	0	0.0	24.0	1,744.8	0	0.0
Minnesota	2.4	415.8	0	0.0	19.6	2,980.1	0	0.0
Mississippi	1.0	215.0	0	0.0	0.0	694.7	0	0.0
Missouri	0.3	8.3	0	0.0	28.2	817.1	0	0.0
Montana	45.1	10,578.7	0	0.0	102.0	6,245.1	8	427.8
Nebraska	0.0	0.0	0	0.0	0.5	10.3	0	0.0
Nevada	0.0	56.5	0	0.0	1.0	140.7	1	29.0
New Hampshire	0.4	156.4	0	0.0	0.0	217.5	2	32.0
New Mexico	1.5	1,578.5	0	0.0	0.0	1,679.5	1	68.8
North Carolina	0.0	585.2	2	97.8	2.6	497.1	1	92.7
Ohio	1.4	262.9	0	0.0	0.0	0.0	0	0.0
Oklahoma	0.0	0.0	0	0.0	0.0	0.0	0	0.0
Oregon	26.0	16,775.4	0	29.3	75.1	14,462.1	7	705.4
Pennsylvania	0.0	281.2	0	0.0	0.1	248.5	1	124.2
Puerto Rico	0.0	0.0	0	0.0	0.0	36.4	0	0.0
South Carolina	1.5	356.6	0	0.0	2.7	423.3	2	125.8
South Dakota	0.0	233.0	0	0.0	9.5	1,383.7	2	43.3
Tennessee	7.2	388.7	0	0.0	16.7	779.5	3	61.7
Texas	0.0	76.0	0	0.0	10.0	621.4	0	0.0
Utah	0.1	1,547.3	0	0.0	12.8	2,585.7	1	62.7
Vermont	1.0	123.0	0	0.0	3.2	238.6	0	0.0
Virginia	6.1	930.6	0	0.5	19.1	1,128.3	1	6.8
Washington	16.7	8,743.5	4	613.0	46.6	8,109.1	4	659.2
West Virginia	11.7	1,502.1	3	158.9	1.9	133.2	0	0.0
Wisconsin	1.6	919.4	0	0.0	25.0	2,725.9	0	0.0
Wyoming	0.2	692.0	0	0.0	7.8	1,089.8	0	0.0
Total	173.4 5/	69,897.1	14	1,607.7	692.4 5/	81,219.4	49	3,407.7

1/ Includes funds for engineering and program support for appropriated roads and timber purchaser roads. Does not include $7,302,371 of Washington Office funds and $135,000 transferred to the Federal Highway Administration (FHwA). The FHwA funds provided for A&E planning and design for future year projects.

2/ States not listed had no Forest Service road programs in 1989.

3/ Does not include 65.6 miles of construction and 120.7 miles of reconstruction turned back to the Forest Service for construction.

4/ Does not include Tongass Timber Supply Fund, 2.9 miles of construction, 4.4 miles of reconstruction, and 5 bridges, totaling $11,321,800.

5/ Includes 41.1 miles of construction/reconstruction accomplished with carryover funds.

Table 41–Road and bridge construction and reconstruction by State--fiscal year 1989--Continued

By Timber Purchasers								
Construction				Reconstruction				State, Commonwealth, or Territory 2/
Roads		Bridges		Roads		Bridges		
Miles 3/	Cost	No.	Cost	Miles 3/	Cost	No.	Cost	
	1000 dollars		*1000 dollars*		*1000 dollars*		*1000 dollars*	
2.2	33.6	0	0.0	43.0	710.4	0	0.0	Alabama
102.3	11,047.4	10	0.0	46.2	42.3	2	0.0	Alaska
19.9	152.1	0	0.0	218.1	1,530.2	0	0.0	Arizona
27.5	270.7	0	0.0	83.0	728.2	0	0.0	Arkansas
147.3	5,178.9	0	0.0	313.4	6,576.9	0	0.0	California
67.6	1,245.7	0	0.0	24.3	110.5	0	0.0	Colorado
0.0	0.0	0	0.0	48.3	624.8	0	0.0	Florida
8.8	196.4	0	0.0	7.5	123.0	0	0.0	Georgia
270.1	6,377.5	1	21.0	347.3	2,588.5	0	0.0	Idaho
0.0	0.0	0	0.0	0.0	0.0	0	0.0	Illinois
0.0	0.0	0	0.0	0.0	0.0	0	0.0	Indiana
15.0	171.9	0	0.0	23.8	157.6	0	0.0	Kentucky
6.1	157.5	0	0.0	68.4	1,114.7	0	0.0	Louisiana
0.0	0.0	0	0.0	0.0	0.0	0	0.0	Maine
13.5	98.9	0	0.0	48.3	241.7	0	0.0	Michigan
11.6	146.4	0	0.0	19.4	130.2	0	0.0	Minnesota
8.4	268.3	0	0.0	91.0	913.8	0	0.0	Mississippi
0.7	5.1	0	0.0	36.4	151.2	0	0.0	Missouri
138.4	2,951.3	0	0.0	99.6	456.9	0	0.0	Montana
0.0	0.0	0	0.0	0.0	0.0	0	0.0	Nebraska
0.0	0.0	0	0.0	0.0	0.0	0	0.0	Nevada
2.3	40.8	4	38.8	10.1	73.7	0	0.0	New Hampshire
43.7	382.0	0	0.0	124.5	866.0	0	0.0	New Mexico
31.5	784.2	0	0.0	46.9	384.8	0	0.0	North Carolina
1.9	22.6	0	0.0	0.0	0.0	0	0.0	Ohio
1.9	16.1	0	0.0	0.0	0.0	0	0.0	Oklahoma
316.5	10,609.8	1	87.3	711.1	11,760.0	0	0.0	Oregon
20.6	489.8	0	0.0	39.6	420.4	0	0.0	Pennsylvania
0.0	0.0	0	0.0	0.0	0.0	0	0.0	Puerto Rico
11.7	637.7	0	0.0	91.3	1,113.0	0	0.0	South Carolina
11.4	264.3	0	0.0	61.9	514.6	1	27.0	South Dakota
15.3	139.5	0	0.0	20.7	79.3	0	0.0	Tennessee
3.3	42.6	0	0.0	24.3	388.1	0	0.0	Texas
33.2	339.7	0	0.0	74.0	228.8	0	0.0	Utah
0.0	0.0	0	0.0	1.5	35.2	0	0.0	Vermont
18.7	248.1	0	0.0	26.5	156.3	0	0.0	Virginia
176.0	3,958.8	0	0.0	102.7	920.1	0	0.0	Washington
13.7	142.8	0	0.0	8.2	580.3	0	0.0	West Virginia
9.0	95.3	0	0.0	20.0	144.0	0	0.0	Wisconsin
34.2	453.3	0	0.0	26.7	183.9	0	0.0	Wyoming
1,584.3	46,969.1	16	147.1	2,908.0	34,049.4	3	27.0	Total

Table 42–Purchaser Election roads constructed by the Forest Service by State--fiscal year 1989

State or Commonwealth 1/	Construction Roads Miles	Construction Roads Cost	Reconstruction Roads Miles	Reconstruction Roads Cost
		1000 dollars		*1,000 dollars*
Alabama	0.0	0.0	3.5	84.9
Arkansas	3.0	33.2	1.1	29.4
Colorado	4.5	21.1	6.8	33.8
Florida	0.0	0.0	10.3	223.5
Georgia	0.7	24.8	1.1	37.5
Idaho	9.5	329.4	25.5	218.0
Louisiana	0.0	0.0	9.4	148.5
Michigan	0.6	8.7	0.5	13.1
Mississippi	0.0	0.0	2.6	32.2
Montana	4.4	52.2	2.2	26.1
New Hampshire	0.3	6.8	3.1	96.2 2/
North Carolina	0.0	4.0	0.0	0
Oregon	18.8	360.1	19.4	242.1
South Carolina	0.8	47.2	6.0	55.8
South Dakota	15.5	280.1	12.6	128.0
Tennessee	0.0	0.5	0.0	0
Texas	0.0	0.0	0.0	0.5
Washington	4.4	44.2	7.6	58.4
West Virginia	0.7	33.0	1.1	20.6
Wyoming	2.4	21.7	7.9	46.4
Total	65.6	1,267.0	120.7	1495.0

1/ States not listed had no timber purchaser roads constructed by the Forest Service in 1989.
2/ Includes 2 bridges.

Table 43—Activities accomplished with excess timber receipts--fiscal year 1989

Activity	Units	Outputs	Funded
Timber sale administration & management		- 1/	29,252
Reforestation	Acres	6,218	9,751 2/
Timber stand improvement	Acres	590	-
Wildlife habitat	Acres Structures	35,415 1,672	19,501 3/
Fish habitat improvement	Acres Structures	2,542 2,163	-
Threatened & endangered species	Acres Structures	67,626 210	-
Soil and water improvement	Acres	20,775	19,501
Cultural resource management		- 1/	4,875
Wilderness management		- 1/	4,875
Forest trail maintenance	Miles	- 1/	5,850
Forest trail construction	Miles	341	3,900
Total resource management			97,505

1/ No targets were assigned to these activities.
2/ Includes funding for reforestation and timber stand improvement.
3/ Includes funding for wildlife, fish, and threatened and endangered species.

Table 44–State and Private Forestry funding--fiscal year 1989 compared to 1985-89 average

	1989				
	Actual	RPA low bound	RPA high bound	1985-89 average	Percent of actual to average
	1,000 constant 1989 dollars				
Appropriated accounts					
Forest pest mangement	49,677	20,079	40,610	40,348	123
Fire protection	13,851	3,656	19,834	14,611	95
Forest management and utilization	10,265	-	23,350	11,027	93
Special projects	12,875	3,012	3,318	7,908	163
Subtotal	86,668	26,747	87,112	73,894	117
Transfer accounts					
Rural community fire protection	3,091	- 1/	-	3,356	92
Watershed and flood prevention	3,198	-	-	3,872	83
Watershed planning	228	-	-	245	93
Resource conservation and development	766	-	-	796	96
River basin surveys and investigations	852	-	-	1,015	84
Forestry Incentives Program 2/	1,245	-	-	1,320	94
Agricultural Conservation Program 2/	1,769	-	-	1,963	90
Subtotal	11,149	0	0	12,567	89
Total	97,817	26,747	87,112	86,461	113

1/ -- = not reported in the RPA.
2/ Includes only technical assistance allocated for the Forestry Incentives and Agricultural Conservation Programs (administered jointly by ASCS and FS).

Table 45–State and Private Forestry funding--fiscal years 1985-89

	1989	1988	1987	1986	1985
			1,000 dollars		
Appropriated accounts					
Forest pest management	49,677	44,441	38,462	28,329	28,825
Fire protection	13,851	13,770	13,661	13,032	13,739
Forest management and utilization	10,265	10,783	10,026	9,518	10,756
Special projects	12,875	10,875	4,405	4,442	4,972
Subtotal	86,668	79,869	66,554	55,321	58,292
Transfer accounts					
Rural community fire protection	3,091	3,091	3,091	3,110	3,250
Watershed and flood prevention	3,198	2,777	3,884	3,948	3,580
Watershed planning	228	241	211	221	240
Resource conservation and development	766	803	643	693	802
River basin surveys and investigations	852	852	869	1,040	1,117
Forestry Incentives Program 1/	1,245	1,189	1,218	1,196	1,250
Agricultural Conservation Program 1/	1,769	1,769	1,800	1,818	1,900
Subtotal	11,149	10,722	11,716	12,026	12,139
Total	97,817	90,591	78,270	67,347	70,431

1/ Includes only technical assistance allocated for the Forestry Incentives and Agricultural Conservation Programs (administered jointly by ASCS and FS.)

Table 46–Summary of State and Private Forestry accomplishments compared to funded output levels and to RPA--fiscal year 1989

	Unit of measure 1/	1989 Funded	1989 Accomplished	1989 Percent of funded	1985-89 average accomplishment	1989 as percent of 5-year average	RPA Low bound	RPA High bound
Appropriated accounts								
Forest pest management 2/								
Insect and disease management surveys	MM acres	554	571.1	103	590.8	97	170	477
Insect and disease suppression	MM acres	- 3/	1.1	-	1.1	97	-	-
Insect and disease special projects	Projects	- 3/	32	-	28.0	114	-	-
Forest management and utilization								
Forest resource management								
Forest land management plans	MM acres	3.2	4.2	131	4.0	106	-	-
Timber harvested	MM cubic feet	-	346	-	276.3	125	-	-
Reforestation 4/	M acres	-	1,163	-	991.8	117	323	782
Timber stand improvement 5/	M acres	-	232	-	261.6	89	156	406
Woodland owners assisted	M owners	-	154	-	150.4	102	-	-
Wood utilization	MM cubic feet	-	-	-			64	139
Seedling, nursery, and tree improvement	MM seedlings	817	852	104	925.2	92	-	-
Urban forestry assistance	Areas assisted	-	7,964	-	5,619.8	142	-	-
Management improvement								
State forest resource planning	Person Years	-	28	-	47.6 6/	59 6/	44	48
Transfer accounts								
Rural community fire protection, FmHA	M approved applications	3.4	3.4	100	3.1	110	-	-
Watershed and flood prevention, SCS 7/	Projects	81	81	100	79.6	102	-	-
Watershed planning, SCS	Plans	83	78	94	64.6	121	-	-
Resource conservation and development, SCS	Projects	60	60	100	51.0	118	-	-
River basin surveys and investigations, SCS	Plans	49	50	102	46.6	107	-	-
Forestry Incentives Program, ASCS 8/								
Reforestation	M acres	-	121	-	148.5	81	-	-
Timber stand improvement	M acres	-	26.1	-	27.2	96	-	-
Agricultural Conservation Program, ASCS 8/								
Reforestation	M acres	-	130.7	-	96.6	135	-	-
Timber stand improvement	M acres	-	21.2	-	22.8	93	-	-

1/ M = thousand, MM = million.
2/ Includes accomplishments on National Forest System and other Federal lands, as well as State and private lands.
3/ -- = not applicable.
4/ Includes Conservation Reserve Program, Forestry Incentives Program and Agricultural Conservation Program accomplishments.
5/ Includes Forestry Incentives Program and Agricultural Conservation Program accomplishments.
6/ Not reported due to change in unit of measure from MM acres to person years.
7/ Includes Emergency Watershed Protection.
8/ Accomplishments for 1989 are estimates; actual data is not available from ASCS.

Table 47–Pesticide use report--fiscal year 1989

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Herbicides:				
Ammonium sulfamate	Wildlife habitat improvement	224.00	60	
	General weed control	0.41	2	
Asulam	Noxious weed control	121.00	12	
Atrazine	Conifer release	13.50	5	
	Firebreak management	200.00	50	
	Range management	174.00	220	
	Wildlife habitat management	430.00	286	
Bromacil	General weed control	0.75	20	
Bromacil/	General weed control	76.60	30	
Diuron		76.60		
	Rights-of-way	288.00	80	
		192.00		
Butylate	Aquatic weed control	27.60	10	
Cacodylic acid	Noxious weed control	4.00	10	
Copper sulfate	Aquatic weed control	33.80	14	
Copper triethanolamine	Aquatic weed control	2.00	1	
Dacthal 3/	Nursery weed control	159.00	21	
Dicamba	Noxious weed control	557.75	1,713	
	Poisonous plant control	27.00	42	
	Range management	8.00	23	
	Rights-of-way	3.00	3	
	Site preparation	128.00	257	
	Wildlife habitat management	2.00	1,000	trees
Dicamba/	Site preparation	50.00	28	
Glyphosate/		42.00		
Triclopyr		50.00		
Dicamba/	Site preparation	29.00	39	
Triclopyr		27.00		
Dichlobenil	General weed control	1.00	30	
Diphenamid	Nursery weed control	234.00	29	
Diuron	Firebreak management	240.00	50	
	Rights-of-way	24.00	24	
Diuron/	Rights-of-way	1.90	1	
Sulfometuron methyl		0.06		
Fosamine ammonium	Firebreak management	4.00	1	
	General weed control	15.00	6	
	Rights-of-way	3,697.19	527	
	Wildlife habitat improvement	118.00	36	
Glyphosate	Aquatic weed control	94.00	224	
	Conifer release	7,279.00	4,412	
	Firebreak management	3.00	1	

See footnotes at end of table

Table 47–Pesticide use report--fiscal year 1989--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Herbicides: (Cont.)				
Glyphosate	General weed control	981.52	624	
	Hardwood release	1,853.60	812	
	Noxious weed control	581.40	608	
	Nursery weed control	718.88	87	
	Poisonous plant control	33.00	19	
	Range management	490.00	237	
	Research	10.00	50	
	Rights-of-way	214.00	91	
	Site preparation	6,095.00	4,685	
	Thinning	342.00	171	
	Wildlife habitat improvement	678.12	602	
	Wildlife habitat improvement	6.00	50	trees
Glyphosate/ Sulfometuron methyl	Conifer release	59.00 6.75	189	
Glyphosate/ Sulfometuron methyl	Site preparation	412.00 38.68	412	
Glyphosate/ Imazapyr	Conifer release	126.00 63.00	84	
Glyphosate/ Triclopyr	Conifer release	79.00 236.00	421	
Hexazinone	Conifer release	13,365.50	10,306	
	Firebreak management	902.00	437	
	General weed control	14.00	7	
	Nursery weed control	16.00	11	
	Site preparation	21,480.00	10,122	
	Wildlife habitat improvement	764.64	792	
	Wildlife habitat improvement	2.00	150	trees
Hexazinone/ Sulfometuron methyl	Conifer release	375.81 79.30	994	
Hexazinone/ Sulfometuron methyl/ Triclopyr	Rights-of-way	0.25 0.03 0.37	330	
Imazapyr	Conifer release	530.18	1,653	
	General weed control	7.00	6	
	Rights-of-way	31.00	68	
	Site preparation	878.10	1,384	
	Wildlife habitat improvement	8.00	8	
Linuron	General weed control	22.50	15	
MCPA	General weed control	186.00	101	
	Noxious weed control	8.00	1	
Mefluidide	General weed control	6.00	25	
	Rights-of-way	0.18	38	

See footnotes at end of table.

Table 47–Pesticide use report--fiscal year 1989--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Herbicides: (Cont.)				
Metsulfuron methyl	Poisonous plant control	1.00	1	
	Rights-of-way	2.62	58	
Mineral spirits	Nursery weed control	165.00	7	
MSMA	Rights-of-way	441.00	158	
Napropamide	Nursery weed control	118.00	37	
Oryzalin	Rights-of-way	119.00	24	
Oxyflourfen	Nursery weed control	196.44	88	
Picloram	Noxious weed control	2,540.66	7,467	
	Poisonous plant control	94.50	337	
	Rights-of-way	6.00	41	
	Site preparation	10.40	21	
	Wildlife habitat improvement	71.89	83	
Picloram/ Glyphosate	Noxious weed control	10.00 3.00	25	
Picloram/ Triclopyr	Rights-of-way	70.00 135.00	45	
Prometon	Rights-of-way	5.00	2	
Sethoxydim	Nursery weed control	71.84	88	
Simazine	Aquatic weed control	8.00	4	acre feet
	Conifer release	11.70	5	
	General weed control	2.39	1,200	square feet
Sulfometuron methyl	Conifer release	702.27	1,500	
	General weed control	68.56	198	
	Rights-of-way	1.92	31	
	Site preparation	745.31	1,564	
Tebuthiuron	Noxious weed control	88.00	185	
	Range management	1,314.00	2,034	
	Wildlife habitat improvement	461.00	477	
Telar 3 3/	Noxious weed control	12.10	100	
	Rights-of-way	8.43	217	
Triclopyr	Conifer release	15,799.30	12,759	
	General weed control	30.00	40	
	Hardwood release	3,560.00	2,604	
	Noxious weed control	534.00	222	
	Poisonous plant control	10.00	1	
	Range management	96.00	98	
	Rights-of-way	780.50	257	
	Rights-of-way	174.00	55	side miles
	Site preparation	21,904.93	18,463	
	Thinning	2,177.00	1,808	
	Wildlife habitat improvement	3,913.50	6,677	
	Wildlife habitat management	27.00	2,200	trees

See footnotes at end of table.

Table 47–Pesticide use report--fiscal year 1989--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Herbicides: (Cont.)				
2,4-D	Aquatic weed control	180.00	10	
	General weed control	110.50	135	
	Noxious weed control	1,651.88	3,071	
	Range management	469.00	585	
	Rights-of-way	1,056.14	299	
	Rights-of-way	228.00	54	side miles
	Wildlife habitat improvement	3,004.00	1,188	
2,4-D/ 2,4-DP	Conifer release	19.80	32	
		19.80		
	Rights-of-way	25.89	14	
		25.89		
2,4-D/ Dicamba	Noxious weed control	3,530.75	2,641	
		1,898.95		
	Poisonous plant control	18.00	12	
		6.00		
2,4-D/ Dicamba/ 2,4-DP	Noxious weed control	48.00	200	
		48.00		
		12.00		
	Wildlife habitat improvement	24.00	12	
		24.00		
		6.00		
2,4-D/ Glyphosate	Site preparation	14.00	5	
		10.00		
2,4-D/ Picloram	Conifer release	295.50	1,472	
		346.19		
	General weed control	40.60	42	
		10.20		
	Hardwood release	22.80	42	
		9.20		
	Noxious weed control	4,980.71	8,742	
		1,554.99		
	Noxious weed control	192.00	113	side miles
		48.00		
	Poisonous plant control	158.00	195	
		46.00		
	Range management	240.00	120	
		60.00		
	Rights-of-way	43.00	82	
		13.39		
	Site preparation	55.39	42	
		35.87		
	Thinning	7.00	46	
		2.00		

See footnotes at end of table.

Table 47–Pesticide use report--fiscal year 1989--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Herbicides: (Cont.)				
2,4-D/	Wildlife habitat improvement	520.00	758	
Picloram		130.00		
	Wildlife habitat improvement	12.00	2,742	trees
		3.24		
2,4-D/	Site preparation	2.00	2	
Sulfometuron methyl/		0.56		
Metsulfuron methyl		0.12		
2,4-D/	Wildlife habitat	10.00	5	
Triclopyr		5.00		
2,4-DP	Conifer release	423.00	257	
	Noxious weed control	23.00	80	
	Rights-of-way	7.14	17	
2,4-DP	Rights-of-way	42.00	8	
Triclopyr		26.00		
Total 1989 herbicide use		144,645.73	121,493	*

* Plus:
6,142 trees
222 side miles
4 acre feet
1,200 square feet

See footnotes at end of table.

Table 47–Pesticide use report--fiscal year 1989--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/		Units treated 1/	
Insecticides:					
Azinphos-methyl	Cone and seed insects	1,225.00		421	(A)
Bacillus thuringiensis var. kurstaki	Gypsy moth	592,456.00	BIU	37,557	(A)
	Tussock moth	1,341,936.00	BIU	83,871	(A)
	Western spruce budworm	206,928.00	BIU	13,183	(A)
Diflubenzuron	Gypsy moth	776.36		24,963	(A)
Fenvalerate	Cone and seed insects	12.00		16	(A)
Nucleopolyhedrosis virus	Gypsy moth	32.91		480	(A)
Pyrethrins	Cone and seed insects	21.00		111	(A)
Acephate	Cone and seed insects	4.66		140	trees
	Tussock moth	2.93		55	trees
	Western spruce budworm	23.51		826	trees
Amdro 3/	Imported fire ant	0.08		320	treatment stns.
Azinphos-methyl	Seedbugs	250.00		20	
Bacillus thuringiensis var. israelensis	Mosquitoes	1.50	BIU	11	
Bacillus thuringiensis var. kurstaki	Western spruce budworm	2,944.00	BIU	72	
Carbaryl	Bark beetles	652.00		85	
	Cone and seed insects	120.00		30	
	Cottonwood leaf beetle	4.00		4	
	Fleas	15.00		150	
	Grasshoppers	15.37		387	
	Mormon cricket	2,588.50		5,177	
	Pine tip moth	8.00		9	
	Spruce beetle	32.00		10	tree groups
	Western pine beetle	4.00		25	tree groups
	Western pine beetle	868.00		870	trees
Carbofuran	Cone and seed insects	50.00		25	trees
Chlorpyrifos	Pales weevil	0.43		115	
	Termites	6.85		250	square feet
Chlorpyrifos	Webworms	14.00		14	
Coumaphos	Mites	263.00		14,000	head of cattle
Diazinon	Carpenter ants	12.40		24	buildings
	Cutworms	73.30		17	
	Nursery insects	140.00		138	
Dimethoate	Tip moths	3.00		6	
Esfenvalerate	Western pine beetle	10.30		245	trees
Fatty acids	Aphids	0.46		1	
Fenbutatin-oxide	Mites	0.10		15	square feet

See footnotes at end of table.

Table 47–Pesticide use report--fiscal year 1989--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Insecticides: (Cont.)				
Fenvalerate	Cone beetles	13.50	5	
	Nursery insects	9.18	90	
	Seedbugs	0.50	20	trees
Lindane	Pine tip moth	0.93	250	grafts
	Seedworms	165.60	20	
	Southern pine beetle	16.00	20	
	Southern pine beetle	2.50	320	trees
Malathion	Grasshoppers	552.00	1,120	
Methyl bromide	Texas leaf-cutting ant	144.00	8	
Nosema locustae	Grasshoppers	0.06	60	
Permethrin	Seedbugs	3.10	1,100	trees
Pheromones	Mountain pine beetle	8.97	80	
Total 1989 insecticide use (including aerial use)		8,145.50 *	168,241 **	
Total aerial use		2,067.27	160,602	

* Pounds only; does not include 2,144,266 BIU's.

** Includes BIU use on 134,694 acres, plus:
- 3,601 trees
- 35 tree groups
- 265 square feet
- 14,000 head of cattle
- 250 grafts
- 24 buildings
- 320 treatment stations

See footnotes at end of table.

Table 47–Pesticide use report--fiscal year 1989--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Fungicides and Fumigants:				
Benomyl	Botrytis	15.50	38	
	Damping-off	11.00	44	
	Fusarium	3.60	14	
	Nursery fungi and disease	523.89	209	
	Nursery fungi	698.00	9,846,000	seedlings
	Powdery mildew	1.50	3	
	Seedling blights	33.00	7	
	Phomopsis canker	18.00	36	
Benomyl/ Ornalin		0.25 0.25		
Borax	*Fomes annosus*	2,955.00	33,295	stumps
Captan	Damping-off	43.00	49	
	Greenhouse diseases	1.00	250	grafts
	Greenhouse diseases	13.00	15	greenhouses
	Nursery root rot	0.20	600	seedlings
Chlorothalonil	Botrytis	90.43	216	
	Botrytis	0.06	1	greenhouse
	Nursery fungi	187.22	179	
	Lophodermium needle blight	106.00	46	
	Nursery blight	34.50	5	
	Other diseases	3.50	6	
	Phoma blight	99.40	23	
Dazomet	Nematodes	120.00	1	
	Nursery fungi	38,329.16	108	
DCNA	Botrytis	31.10	34	
	Botrytis	4.50	15	greenhouses
	Nursery fungi	3.94	4	
DCNA/	Nursery fungi and disease	0.50	86,400	seedlings
Dodine	Shot hole disease	8.00	6	
Ethephon	Mistletoe control	1.00	15	trees
Maneb	Lophodermium needle blight	72.00	33	
Metalaxyl	Nursery root rot	0.25	284,720	seedlings
	Nursery root rot	12.87	10	
Methyl bromide/ Chloropicrin	Damping-off	5,664.00 2,772.00	24	
	Nematodes	2,584.00 1,584.00	13	
	Nursery fungi and disease	27,772.40 13,805.20	120	
	Nursery root rot	34,036.00 16,526.00	127	

See footnotes at end of table.

Table 47–Pesticide use report--fiscal year 1989--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Fungicides and Fumigants: (Cont.)				
Triadimefon	Fusiform rust	17.00	35	
	Fusiform rust	5.00	1,841	pounds of seed
	White pine blister rust	0.15	12	
Total 1989 fungicide and fumigant use		148,187.37	1,402	*

* Plus:
1,841 pounds of seed
10,217,720 seedlings
33,295 stumps
250 grafts
31 greenhouses
15 trees

See footnotes at end of table.

Table 47–Pesticide use report--fiscal year 1989--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Predacides and Piscicides:				
Antimycin	Undesirable fish	0.10	2	acre feet
Rotenone	Undesirable fish	21.00	19	
	Undesirable fish	2.00	18	stream miles
Sodium cyanide	Coyotes	0.14	41,895	
	Coyotes	0.02	10	treatment stns.
Total 1989 predacide and piscicide use		23.26	41,914	
Repellents:				
Putrescent egg solids	Deer	0.19	26	
	Deer	4.00	20,000	seedlings
Thiram	Birds	29.90	6,563	pnds. of seed
Total 1989 repellent use		34.09	26	
Rodenticides:				
Aluminum phosphide	Ground squirrels	6.25	293	burrows
	Pocket gophers	4.98	2	
	Prairie dogs	34.00	248	
	Prairie dogs	12.81	1,000	burrows
Carbon monoxide	Ground squirrels	6.10	12	
Diphacinone	Ground squirrels	0.50	50	
	Pocket gophers	21.07	9,473	
Strychnine	Pocket gophers	193.35	41,292	
	Pocket gophers	0.12	30	burrows
Warfarin	Mice	0.25	4	treatment stns.
	Pack rats	0.25	3	buildings
Zinc phosphide	Prairie dogs	59.00	7,885	
Total 1989 rodenticide use		338.68	58,962	
Grand total pesticide use		301,374.63	392,053	

1/ Acres, unless other units are indicated. Aerial applications are indicated by (A). All others are ground application.
2/ Pounds, unless other units are indicated. BIU = billion international units.
3/ Registered trademark; no common name.

This page was left blank intentionally.

Table 48–Wildfires on State and private lands protected under the Cooperative Forestry Assistance Act (P.L. 95-313)--calendar year 1988

State, Commonwealth, or Territory	Acres protected	Lightening fires	Person-caused fires	Total fires	Acres burned
	1,000 acres	*Number*	*Number*	*Number*	*Number*
Alabama	25,726	164	12,126	12,290	238,865
Alaska	66,301	46	1,783	1,829	131,088
Arizona	22,447	74	438	512	25,011
Arkansas	19,728	147	2,764	2,911	34,874
California	32,070	646	7,484	8,130	190,835
Colorado	25,958	222	1,500	1,722	33,037
Connecticut	2,390	2	1,334	1,336	3,421
Delaware	557	6	34	40	1,482
Florida	25,380	657	5,258	5,915	193,879
Georgia	27,279	500	10,978	11,478	50,500
Guam	82	0	0	0	0
Hawaii	3,306	8	67	75	16,626
Idaho	6,026	196	260	456	12,965
Illinois	10,670	1	105	106	2,741
Indiana	7,328	2	374	376	3,052
Iowa	7,612	28	4,366	4,394	16,075
Kansas	45,296	139	6,460	6,599	233,306
Kentucky	16,936	28	2,609	2,637	80,113
Louisiana	68	39	5,785	5,824	67,720
Maine	17,743	145	660	805	2,668
Maryland	3,550	32	943	975	8,508
Massachusetts	3,581	25	6,598	6,623	7,205
Michigan	20,600	145	950	1,095	8,049
Minnesota	22,800	171	2,871	3,042	170,736
Mississippi	19,858	52	6,861	6,913	108,941
Missouri	16,587	49	3,877	3,926	52,303
Montana	48,633	290	388	678	68,206
Nebraska	49,084	121	2,014	2,135	56,769
Nevada	40,279	55	115	170	10,485
New Hampshire	4,631	16	650	666	587
New Jersey	2,895	18	1,790	1,808	3,565
New Mexico	42,500	107	601	708	131,961
New York	16,958	26	530	556	5,031
North Carolina	24	144	4,405	4,549	23,815
North Dakota	31,879	138	852	990	84,803
Ohio	5,822	6	1,430	1,436	8,259
Oklahoma	5,945	32	2,230	2,262	43,979
Oregon	13,129	200	807	1,007	21,587
Pennsylvania	19,541	40	1,721	1,761	6,803
Rhode Island	433	0	244	244	564
South Carolina	12,558	222	7,956	8,178	44,135
South Dakota	20,653	292	879	1,171	69,512
Tennessee	12,672	64	4,002	4,066	51,029
Texas	22,123	45	3,073	3,118	52,925
Utah	15,000	255	350	605	25,400
Vermont	4,638	7	252	259	517
Virginia	18,325	96	1,508	1,604	6,913
Washington	12,500	32	1,040	1,072	27,000
West Virginia	12,833	35	2,272	2,307	42,156
Wisconsin	18,898	320	2,922	3,242	9,740
Wyoming	29,109	531	925	1,456	124,127
Total	910,941	6,616	129,441	136,057	2,613,868

Table 49–Summary of selected cooperative forest management and processing program activities--selected fiscal years

	Woodland owners assisted	Timber sale assistance-- volume marked	Loggers and processors assisted
		MBF 1/	
1945	8,093	411,330	0
1950	22,828	518,566	0
1955	34,828	549,373	8,182
1960	82,188	569,178	8,099
1965	99,074	716,950	9,248
1970	115,197	1,225,520	13,620
1971	127,828	860,950	14,627
1972	274,001	955,627	5,290
1973	106,422	1,578,664	4,855
1974	117,990	907,311	5,353
1975	140,940	677,532	5,405
1976	105,184	596,599	15,318
1976 -77 (T.Q.) 2/	25,253	220,649	5,849
1977	133,619	921,171	29,101
1978	165,329	1,120,743	12,749
1979	183,585	755,103	11,393
1980	176,385	870,964	11,582
1981	164,279	683,181	18,609
1982	141,472	841,475	15,470
1983	136,265	872,125	8,717
1984	151,539	1,033,440	10,082 3/
1985	134,338	913,411	- 4/
1986	137,753	855,813	- 4/
1987	158,353	1,225,896	- 4/
1988	167,432	890,581	- 4/
1989	153,855	1,242,564	- 4/

1/ MBF = thousand board feet.
2/ Transition quarter.
3/ Not all states reported.
4/ Inadequate data due to lack of State grants in wood utilization program.

Table 50–Summary of selected cooperative forest management and processing activities by Region--fiscal year 1989

Assistance activity	Unit of measure 1/	Regions				
		Northern	Rocky Mountain	South-western	Inter-mountain	Pacific Southwest
Woodland owners assisted	Number	4,206	4,882	198	566	6,084
Forest management plans prepared	Number	402	397	54	43	170
	Acres	33,821	26,129	101,590	5,772	52,562
Reforestation:						
Planting	Acres	908	1,320	344	110	3,273
Seeding	Acres	20	169	0	0	2,506
Management for natural regeneration	Acres	396	3,477	1,863	145	5,320
Timber stand improvement	Acres	602	5,734	180	4,800	2,586
Outdoor recreation development	Acres	295	5,626	10,826	750	25
Wildlife habitat development	Acres	5,110	7,242	11,326	2,200	5,764
Forested range improvement	Acres	1,211	4,745	12,380	2,400	8,513
Timber sale assistance volume harvested	M cubic feet	2,835	5,105	968	160	17,765
Urban forestry assistance activities	Urban areas assisted	211	587	19	228	459
Referrals to consulting foresters	Number	101	363	25	11	926

See footnote at end of table.

Table 50–Summary of selected cooperative forest management and processing activities by Region--fiscal year 1989 (Continued)

Assistance activity	Unit of measure 1/	Regions				
		Pacific Northwest	Alaska	Southern	Northeastern Area	Total
Woodland owners assisted	Number	5,523	159	64,091	68,146	153,855
Forest management plans prepared	Number	1,048	159	51,856	16,844	70,973
	Acres	70,074	155,680	2,702,765	1,030,199	4,178,592
Reforestation:						
Planting	Acres	23,785	60	922,475	72,056	1,024,331
Seeding	Acres	0	0	10,383	658	13,736
Management for natural regeneration	Acres	8,019	85	69,804	35,547	124,656
Timber stand improvement	Acres	33,924	45	138,135	45,900	231,906
Outdoor recreation development	Acres	0	0	94,759	58,713	170,994
Wildlife habitat development	Acres	2,535	405	354,745	138,092	527,419
Forested range improvement	Acres	1,296	0	15,013	8,993	54,551
Timber sale assistance volume harvested	M cubic feet	20,221	75	210,555	88,459	346,143
Urban forestry assistance activities	Urban areas assisted	29	5	2,535	3,891	7,964
Referrals to consulting foresters	Number	197	5	6,644	8,276	16,548

1/ M = thousand.

Table 51–Summary of selected cooperative forest management and processing activities by State--fiscal year 1989

State, Commonwealth, or Territory	Woodland owners assisted	Reforestation assistance	Timber stand improvement assistance	Timber sale assistance--harvest volume	State nursery production
		Acres	*Acres*	*1,000 cubic feet*	*1,000 trees*
Alabama	0	112,256	42,711	0	48,093
Alaska	159	145	45	75	450
American Samoa	0	0	0	0	0
Arizona	73	2,157	130	537	0
Arkansas	2,330	35,639	2,048	92	28,230
California	5,401	10,262	2,034	17,765	2,118
Colorado	1,951	2,906	419	3,802	1,773
Com. of N. Marianas	7	15	37	0	14
Connecticut	597	896	273	0	1,400
Delaware	810	1,385	340	454	0
Fed. Sta. Micronesia	242	71	110	0	38
Florida	3,569	84,397	13,455	4,906	44,252
Georgia	16,719	221,231	22,049	1,625	133,741
Guam	60	41	88	0	42
Hawaii	331	283	311	0	440
Idaho	2,864	398	412	268	761
Illinois	17,014	5,249	4,267	1,439	3,790
Indiana	2,795	5,345	5,044	1,240	6,745
Iowa	1,583	7,905	1,887	486	3,070
Kansas	680	763	1,023	419	76
Kentucky	1,353	5,340	1,859	2,613	8,928
Louisiana	1,729	32,056	3,240	675	56,641
Maine	1,331	1,455	2,029	291	0
Maryland	2,962	6,071	5,305	5,065	4,300
Massachusetts	1,274	15,951	1,761	5,904	0
Michigan	1,062	13,001	4,896	23,366	4,725
Minnesota	6,381	19,236	1,509	6,814	20,365
Mississippi	16,390	137,490	16,968	58,712	74,978
Missouri	2,288	3,800	2,507	3,174	6,805
Montana	662	604	160	2,532	1,526
Nebraska	910	320	52	1	0
Nevada	540	255	4,800	38	255
New Hampshire	2,766	425	735	642	500
New Jersey	1,369	569	260	387	285
New Mexico	125	50	50	431	40
New York	2,764	5,291	2,801	4,908	5,800
North Carolina	7,130	110,025	2,946	30,295	35,882
North Dakota	680	322	30	35	1,212
Ohio	4,975	3,007	3,260	3,258	7,440
Oklahoma	1,056	2,179	643	27,588	3,492
Oregon	4,455	22,895	28,473	814	15,937
Palau	32	3	6	0	18
Pennsylvania	2,961	1,507	2,242	1,681	3,780
Puerto Rico	928	312	222	0	348
Republic of Marshall	11	424	0	0	20
Rhode Island	309	101	229	255	0

Table 51–Summary of selected cooperative forest management and processing activities by State--fiscal year 1989 (Continued)

State, Commonwealth, or Territory	Woodland owners assisted	Reforestation assistance	Timber stand improvement assistance	Timber sale assistance--harvest volume	State nursery production
		Acres	*Acres*	*1,000 cubic feet*	*1,000 trees*
South Carolina	4,078	134,681	3,724	913	153,450
South Dakota	1,062	745	323	77	1,260
Tennessee	0	11,166	155	2,496	11,853
Texas	2,242	25,066	1,812	14,408	26,877
Utah	26	0	0	122	273
Vermont	4,243	503	1,890	8,867	498
Virginia	6,567	90,824	26,303	66,232	69,790
Washington	1,068	8,909	5,451	19,407	8,550
West Virginia	3,983	4,235	2,225	1,988	2,653
Wisconsin	6,679	12,329	2,440	18,240	25,325
Wyoming	279	232	3,917	806	0
Total	153,855	1,162,723	231,906	346,143	828,839

Table 52–Small watershed protection accomplishments--fiscal years 1985-89 (P.L. 83-566, Act of 1954) 1/

	Unit of measure	1989	1988	1987	1986	1985
Land treatment 2/	Acres					
Forest land		8,735	9,692	5,462	9,785	7,492
Cropland		2,395	2,079	1,061	2,802	1,488
Pastureland		156	831	424	1,121	598
Total land treatment		11,286	12,602	6,947	13,708	9,578
Land owners assisted	Number	1,238	1,068	372	581	675

1/ Accomplishments are limited to activities accomplished soley by small watershed protection program funds.
2/ Reported in land use categories consistent with those reported by the Soil Conservation Service.

Table 53–Flood prevention accomplishments--fiscal years 1985-89 (P.L. 78-534, Act of 1944) 1/

	Unit of measure	1989	1988	1987	1986	1985
Land treatment 2/	Acres					
Forest land		15,349	6,742	6,399	18,702	17,890
Cropland		253	454	793	925	1,160
Pastureland		259	182	317	370	464
Total land treatment		15,861	7,378	7,509	19,997	19,514
Land owners assisted	Number	2,091	2,932	5,113	3,416	3,100

1/ Accomplishments are limited to activities accomplished soley by small watershed protection program funds.
2/ Reported in land use categories consistent with those reported by the Soil Conservation Service.

Table 54–Forest Research funding--fiscal year 1989 compared to 1985-89 average 1/

	Actual	RPA Low bound	RPA High bound	1985-89 average	Percent of actual to average
		1,000 constant 1989 dollars			
Appropriated funds:					
Forest protection research	33,181	29,815	32,196	32,762	101
Resource analysis research	25,617	22,320	26,530	26,178	98
Timber management research	26,972	22,948	25,013	25,903	104
Forest environment research	31,100	25,970	29,490	28,335	110
Forest products and harvesting research	20,497	18,835	22,447	20,406	100
Special projects, competitive grants 2/	-	- 3/	-	-	-
Research Challenge Cost-Share program 4/	500	-	-	-	-
Subtotal	137,867	119,888	135,676	133,683	103
Research construction	1,550	370	1,850	1,504	103
Total, appropriated accounts	139,417	120,258	137,526	135,187	103
Reimbursable accounts	12,346	- 3/	- 3/	11,069	112
Grand total	151,763	120,258	137,526	146,256	104

1/ General Administration has been eliminated from individual line items in calculating the average. Total appropriated General Administration funds are included in the General Administration line item in tables 2 and 3.
2/ Funds transferred to the Competitive Research Grants Office, Cooperative State Research Service, Department of Agriculture, included here as a non-add item.
3/ Not reported in the RPA.
4/ New account in 1989.

Table 55–Forest Research funding--fiscal years 1985-89 1/

	1989	1988	1987	1986	1985
			1,000 dollars		
Appropriated funds:					
Forest protection research	33,181	31,490	31,224	27,902	29,110
Resource analysis research	25,617	25,353	24,644	22,735	23,730
Timber management research	26,972	26,548	23,891	21,501	22,161
Forest environment research	31,100	29,259	28,154	23,922	20,337
Forest products and harvesting research	20,497	19,860	18,808	17,560	18,488
Special projects, competitive grants 2/	0	(3,000)	(6,000)	(6,507)	(7,840)
Research Challenge Cost-Share program 3/	500	0	0	0	0
Subtotal	137,867	132,510	126,721	113,620	113,826
Research construction	1,550	2,908	343	642	1,634
Total, appropriated accounts	139,417	135,418	127,064	114,262	115,460
Reimbursable accounts 4/	12,346	14,152	11,329	9,057	5,256
Grand total	151,763	149,570	138,393	123,319	120,716

1/ Budget structure was revised in fiscal year 1989 into five major budget line items. General Administration has been eliminated from individual line items. Total appropriated General Administration is included in tables 2 and 3.
2/ New account in 1985. Funds are transferred to the Competitive Research Grants Office, Cooperative State Research Service, Department of Agriculture, which administers the competitive grants research program.
3/ New account in 1989.
4/ Prior years were reported in error. Corrections made to this report.

Table 56–Extramural research funded through the Forest Service--fiscal years 1988-89

Type of recipient	1989		1988	
	1,000 dollars	*Number of grants*	*1,000 dollars*	*Number of grants*
Domestic grantees:				
Universities and colleges:				
Land Grant research institutions	11,297	340	10,384	329
1890 Land Grant and predominately black institutions	94	4	531	16
Other non-Land Grant institutions	2,069	44	1,957	59
Subtotal, universities and colleges	13,460	388	12,872	404
Other domestic:				
Industrial firms	0	0	40	2
Profit organizations	37	2	--	--
Nonprofit institutions and organizations	1,510	42	505	8
Federal, State, and local governments	507	19	444	17
Private individuals	37	4	48	8
Small business innovation research	361	9	528	15
Subtotal, other domestic	2,452	76	1,565	50
Total, domestic	15,912	464	14,437	454
Foreign grantees:				
Universities and colleges	41	3	16	2
Nonprofit institutions and organizations	0	0	8	1
Private individuals	80	6	13	4
Total, foreign grantees	121	9	37	7
Grand total	16,033	473	14,474	461

Table 57–Research publications by major subject area--fiscal years 1986-89

	Number of publications			
	1989	1988	1987	1986
Environmental Research:				
Watershed management	96	156	134	138
Wildlife	147	156	162	165
Range	59	82	92	94
Fisheries habitat	17	38	27	26
Urban and community forestry	17	31	42	45
Disturbed areas rehabilitation	50	33	19	26
Atmospheric deposition and air pollution	123	59	36	39
Subtotal	509	555	512	533
Insect and Disease Research:				
Insect detection and evaluation	34	52	54	57
Insect biology	57	44	96	98
Insect control and management strategies	69	63	90	92
Disease detection and evaluation	43	19	67	65
Disease biology	44	54	46	48
Disease control and management strategies	31	51	24	29
Mycorrhizae	25	42	17	21
Wood products organisms	25	14	17	18
Subtotal	328	339	411	428
Fire and Atmospheric Sciences Research: 1/				
Fire prevention, hazard reduction, and prescribed burning	-	35	20	20
Fire management methods and systems	-	27	20	21
Fire physics, chemistry (science) and behavior	7	14	28	28
Fire economics and management	15	-	-	-
Fire ecological relations and effects	34	37	18	19
Meteorology and climatology weather modification and effects	19	10	17	19
Air resource management	13	-	-	-
Subtotal	88	123	103	107
Timber Management Research:				
Forest biology	118	173	160	158
Silviculture and management	176	153	153	162
Growth and yield	83	127	66	69
Genetics and tree improvement	89	72	78	87
Subtotal	466	525	457	476

Table 57–Research publications by major subject area--fiscal years 1986-89--Continued

	Number of publications			
	1989	1988	1987	1986
Economics, Marketing and Recreation Research:				
Forest resource inventory and analysis	109	203	138	143
Forest economics	190	131	196	205
Forest recreation 2/	54	44	62	65
Subtotal	353	378	396	413
Products and Engineering Research:				
Forest engineering systems	40	57	70	71
Wood structural engineering	47	71	51	53
Chemistry, fiber, and fuel products	90	25	60	62
Utilization potential and processing of wood	54	77	128	135
Protection of wood in use	24	55	29	31
Subtotal	255	285	338	352
General	79	22	20	21
Grand total	2,078	2,227	2,237	2,330

1/ New categories for fire and atmospheric sciences research are introduced in this report that better reflect the expected focus of future research.
2/ Forest recreation research was reassigned from environment research category in FY 1989

Table 58–Summary statement of receipts and obligations--fiscal years 1988-89 1/

	1989		1988		Percent of Change 1988 to 1989	
	Receipts	Obligations	Receipts	Obligations	Receipts	Obligations
National Forest programs:			*1,000 constant 1989 dollars*			
Cash receipts:						
Sale of timber and use of other forest resources	997,594	0	988,197	0	1	0
Use of National Grasslands & land utilization areas	53,220	0	31,171	0	71	0
Timber sale area betterment (K-V) 2/	241,706	0	247,522	0	-2	0
Cooperative work for others	52,557	0	60,665	0	-13	0
Brush disposal	54,456	0	60,950	0	-11	0
Miscellaneous (sales, rentals, damages, etc.) 3/	8,853	0	10,626	0	-17	0
Restoration of forest lands and improvements	122	0	83	0	47	0
Golden Eagle Passports	-9	0	24	0	-138	0
Timber salvage sales	131,957	0	30,341	0	335	0
Operation & maintenance of quarters	5,648	0	5,834	0	-3	0
Gifts, donations, and bequests	2,090	0	1,640	0	27	0
Subtotal	1,548,194	0	1,437,053	0	8	0
Cash receipts from NFS lands collected in conjunction with, and deposited to, accounts of other agencies	181,355	0	144,070	0	26	0
Non-cash income (roads built by timber purchasers)	106,541	0	101,922	0	5	0
Total	1,836,090	0	1,683,046	0	9	0
Obligations:						
Operating costs	0	2,549,109	0	2,086,098	0	0
Capital outlay	0	198,071	0	258,677	0	0
Total	0	2,747,180	0	2,344,775	0	17
Other Forest Service programs:						
Forest Research programs:						
Forest research	0	145,191	0	152,320	0	-5
Research construction	0	615	0	736	0	-16
Cooperative research work 4/	0	2,974	0	3,199	0	-7
Gifts, donations, and bequests for forest rangeland research	2	2,306	3	0 1,373	-36	68
Tongass Timber Supply Fund	0	1,982	0	1,719	0	15
Energy security reserve	0	0	0	1	0	0
Subtotal	2	153,068	3	159,349	-36	-4

See footnotes at end of table.

Table 58–Summary statement of receipts and obligations--fiscal years 1988-89--Continued

	1989		1988		Percent of Change 1988 to 1989	
	Receipts	Obligations	Receipts	Obligations	Receipts	Obligations
			1,000 constant 1989 dollars			
State and Private Forestry programs:						
State and Private Forestry cooperation	0	82,181	0	95,490	0	-14
Rural community fire protection	0	3,057	0	3,194	0	-4
Flood prevention and watershed protection	0	2,436	0	1,597	0	52
Licensee programs (Woodsy Owl and Smokey Bear)	77	-65	0	320	0	-120
Forestry Incentives and other programs 5/	0	1,907	0	2,020	0	-6
Subtotal	77	89,516	0	102,621	0	-13
Human Resource programs:						
Job Corps	0	60,842	0	63,147	0	-4
Senior Community Service Employment	0	22,025	0	23,547	0	-6
Subtotal	0	82,867	0	86,693	0	-4
Grand total, all programs	1,836,169	3,072,631	1,683,049	2,693,438	9	14
Cash receipts distributed to States, counties and Puerto Rico:						
Payments to States and Puerto Rico	0	353,806	0	305,026	0	16
Payment to Minnesota	0	1,116	0	745	0	50
Payments to counties, (National Grasslands and Land Utilization Areas)	0	7,187	0 0	0 11,455	0	-37
Subtotal	0	362,109	0	317,225	0	14
Internal equipment and supply service (Working Capital)	101,597	118,762	92,480	106,921	10	11
Reimbursements for work performed for government and others included above	0	72,746	0	79,436	0	-8

1/ Obligations were incurred on a "charged-as-worked" basis.
2/ K-V = Knutson-Vandenberg.
3/ Includes sale of personal property and acquisitions of lands to complete land exchanges.
4/ Receipts not available as a separate item after FY 1987.
5/ Includes Resource Conservation and Development, River Basins, and Pesticide Impact assessment funds transferred from Agricultural Research Service.

Table 59–Summary statement of values and obligations--fiscal year 1989

Item	Units 1/	Quantity	Average value per unit	Total value
				Million dollars
Value:				
Minerals				
Common variety	- 2/	-	-	50.0
Locatable	-	-	-	780.0
Leasable				
Oil	M BBL	20,851	16.50	344.0
Gas	MMCF	204,000	1.87	381.5
Coal	M tons	65,500	35.50	2,325.3
Others				950.0
Timber (excluding free firewood)	MBF	10,500	102.61 3/	1,077.5
Recreation	M RVD	252,495	24.59 4/	6,208.9
Wilderness and primitive areas	M RVD	11,572	32.75	378.9
Wildlife and fish				
Recreation	M WFUD	41,800	24.36	1,018.2
Commercial	M pounds	118,000	997.04	117.6
Range 5/	M AUM	9,566	6.89	65.9
Total value				13,697.8
Expenditures:				
National Forest System				2,747.2
Forest Research				153.1
State and Private Forestry				89.5
Human Resource Programs				82.9
Total expenditures				3,072.7
Net value, total				10,625.1
Net value, National Forest System only				10,950.6

1/ M BBL = thousand barrels; MMCF = million cubic feet; M tons = thousand tons; MBF = thousand board feet; M RVD = thousand recreation visitor days; M pounds = thousand pounds; M AUM = thousand animal unit months; M WFUD = thousand wildlife fish user days; AF = acre feet.
2/ - = not available.
3/ Actual value at time of sale.
4/ Exclusive of wilderness, wildlife, and fish.
5/ Based on permitted to graze animal unit months of forage. Value is a Forest Service-wide weighted average based on maximum ability to pay. Ability to pay reflects income derived by the user from use of the resource.

This page was left blank intentionally.

Table 60–Statement of receipts--fiscal years 1985-89

	1989	1988	1987	1986	1985
			1,000 dollars		
Receipts from sale and use of forest resources:					
Timber and forest products	909,516	888,373	807,941	745,132	514,561
Grazing	10,949	8,738	8,104	8,617	9,040
Land uses	4,508	4,472	4,394	4,073	3,348
Recreation	38,132	34,307	30,579	30,275	30,829
Power	871	824	688	765	647
Minerals	86,838	43,447	46,688	42,913	77,522 1/
Subtotal	1,050,814	980,161	898,394	831,775	635,947
Receipts from deposits for expenditures on National Forests:					
Timber sale area betterment	241,706	238,002	196,695	156,092	186,107
Timber salvage sales	131,957	29,174	18,137	20,677	15,232
Brush disposal	54,456	58,606	61,214	52,936	53,734
Restoration of Forest Service lands and improvements	122	80	183	176	172
Cooperative work	52,557	58,332	53,743	43,423	38,613
Operation and maintenance of quarters	5,648	5,610	5,730	5,352	4,854
Gifts, donations, and bequests	2,090	1,577	45	25	36
Subtotal	488,536	391,381	335,747	278,681	298,748
Other receipts:					
Miscellaneous (sales, rents, etc.)	8,505	9,889	11,947	10,644	5,236
Golden Eagle passports	-9	23	5	3	2
Sale of personal property	23	3	12	17	10
Cooperative research 2/	0	0	3,581	3,001	1,265
Royalties from sale of Smokey Bear and Woodsy Owl products	77	106	87	96	74
Acquisition of lands to complete land exchanges	325	325	385	1,573	1,086
Gifts, donations, and bequests for forest rangeland research	2	3	27	0	0
Subtotal	8,923	10,349	16,044	15,334	7,673

See footnotes at end of table.

Table 60–Statement of receipts--fiscal years 1985-89--Continued

	1989	1988	1987	1986	1985
			1,000 dollars		
Other income:					
Estimated collections by Department of Energy for power licenses on proclaimed National Forest land	1,722	1,175	601	439	543
Estimated collections by Department of the Interior for mineral leases on proclaimed National Forest land	179,633	137,354	102,913	77,286	81,878
Value of roads built by timber purchasers applied in lieu of cash payment for timber	106,541	98,002	104,263	117,026	107,949
Subtotal	287,896	236,531	207,777	194,751	190,370
Total	1,836,169	1,618,422	1,457,962	1,320,541	1,132,738
Other net deposits:					
Monies advanced on active timber sales 3/					
Balance from previous year	253,237	247,250	219,872	192,180	213,853
Deposited current year	1,397,928	1,350,365	1,169,636	1,014,971	842,201
Transferred to other accounts	-1,390,497	-1,344,378	1,142,258	-987,279	-863,874
Balance on deposit	260,668	253,237	247,250	219,872	192,180
Amounts deposited pending disposition 4/					
Balance from previous year	27,610	16,492	9,396	18,553	328
Deposited current year	9,609	14,790	11,943	20,072	34,012
Transferred to other accounts	-8,868	-3,672	-4,847	-29,229	-15,787
Balance on deposit	28,351	27,610	16,492	9,396	18,553
Subtotal	289,019	280,847	263,742	229,268	210,733
Total	2,125,188	1,899,269	1,721,704	1,549,809	1,343,471

1/ Includes $19 million adjusted windfall profit tax payment for 1980-84.
2/ Not available as a separate item after 1987. Included in Cooperative Work, above.
3/ Timber sale deposits made by timber purchasers.
4/ Budget clearing account.

Table 61–Statement of receipts--fiscal year 1989

	National Forests	Oregon and California grant lands	National Grasslands & L.U. Areas 1/	Other	Total
			1,000 dollars		
Receipts from sale and use of forest resources:					
Timber and forest products	875,737	33,777	2		909,516
Grazing	10,073	2	874		10,949
Land uses	4,276	2	230		4,508
Recreation	38,042	77	13		38,132
Power	863	-	9		872
Minerals	34,763	-18 2/	52,092		86,837
Subtotal	963,754	33,840	53,220		1,050,814
Receipts from deposits for expenditures on National Forests:					
Timber sale area betterment	241,706				241,706
Timber salvage sales	131,957				131,957
Brush disposal	54,456				54,456
Restoration of Forest Service lands and improvements	122				122
Cooperative work	52,557				52,557
Operation and maintenance of quarters	5,648				5,648
Gifts, donations, and bequests	2,090				2,090
Subtotal	488,536				488,536
Other receipts:					
Miscellaneous (sales, rents, etc.)				8,505	8,505
Golden Eagle passports 3/				-9	-9
Sale of personal property 3/				23	23
Cooperative research 4/				0	0
Royalties from sale of Smokey Bear and Woodsy Owl products				77	77
Acquisition of lands to complete land exchanges				325	325
Gifts, donations, and bequests for forest rangeland research				2	2
Subtotal				8,923	8,923

See footnotes at end of table

Table 61–Statement of receipts--fiscal year 1989--Continued

	National Forests	Oregon and California grant lands	National Grasslands & L.U. Areas 1/	Other	Total
			1,000 dollars		
Other income:					
Estimated collections by Department of Energy for power licenses on proclaimed National Forest land	1,722				1,722
Estimated collections by Department of the Interior for mineral leases on proclaimed National Forest land	179,633				179,633
Value of roads built by timber purchasers in lieu of cash	106,541				106,541
Subtotal	287,896				287,896
Total	1,740,186	33,840	53,220	8,923	1,836,169
Other net deposits:					
Monies advanced on active timber sales					
Balance from previous year	253,237				253,237
Deposited current year	1,397,928				1,397,928
Transferred to other accounts	-1,390,497				-1,390,497
Balance on deposit	260,668				260,668
Amounts deposited pending disposition					
Balance from previous year	27,610				27,610
Deposited current year	9,609				9,609
Transferred to other accounts	-8,868				-8,868
Balance on deposit	28,351				28,351
Subtotal	289,019				289,019
Grand total	2,029,205	33,840	53,220	8,923	2,125,188

1/ Land Utilization Projects.
2/ -$18,000 should have been an adjustment to National Forest receipts in fiscal year 1989. Correction was made in fiscal year 1990.
3/ These receipts are credited to the Department of the Interior. The credit balance is an adjustment of deposits made in the previous year.
4/ Not available as a separate item after FY 1987. Included in Cooperative Work, above.

Table 62–Statement of obligations--fiscal year 1989 1/

	Total	Work for other public agencies (reimbursables)
	1,000 dollars	
National Forest System:		
Protection and management	903,634	20,046
Fighting forest fires	573,443 2/	9,162
Cooperative work for others	53,867	0
Cooperative law enforcement	619	(1)
Flood prevention and watershed protection	369	1
Restoration of forest lands and improvements	72	0
Reforestation and timber stand improvement 3/	31,374	0
Timber sale betterment (K-V) 4/	405,650	0
Brush disposal	57,347	0
Timber salvage sales	61,090	0
Oregon and California grant lands	(7)	0
Range betterment	3,851	0
Construction of facilities	29,777	2,767
Acquisition of lands, Forest Service	845	0
Acquisition of lands, Columbia Gorge	400	0
Acquisition of lands, Land and Water Conservation Fund	66,674	10
Construction of forest roads and trails	177,487	889
Timber purchaser roads constructed by the Forest Service	3,029	0
Restoration of roads, Federal Highway funds	1,564	0
Road construction, Mount St. Helens, highway trust	329	0
Road and trail maintenance	8,754	2
Mount St. Helens emergency activities	0	0
Tongass Timber Supply Fund	32,398	(1)
General Administration	274,524	0
Operation & maintenance of quarters	5,832	0
Hazardous waste management	2,690	0
Department of Transportation-Coast Guard	1,942	0
Resource management timber receipts	49,626	0
Subtotal	2,747,180	32,875
Research:		
Tongass Timber Supply Fund	1,982	0
Forest research	145,191	12,346
Construction of research facilities	615	(1,468)
Cooperative research	2,974	0
Energy security reserve, DOE	0	0
Gifts, donations, and bequests for forest and rangeland research	2,306	0
Subtotal	153,068	10,878

See footnotes at end of table.

Table 62–Statement of obligations--fiscal year 1989--Continued

	Total	Work for other public agencies (reimbursables)
	1,000 dollars	
State and Private Forestry:		
Cooperation and general forestry assistance	82,181	6,038
Resource conservation and development	725	0
Rural community fire protection grants	3,057	0
River basins	827	0
Flood prevention and watershed planning	2,436	0
Licensee programs (Smokey Bear and Woodsy Owl)	(65)	0
Forestry Incentives Program, Agricultural Conservation Program, and Pesticide Impact Assessment	355	0
Subtotal	89,516	6,038
Human Resource Programs:		
Job Corps	60,842	930
Senior Community Service Employment Program	22,025	22,025
Subtotal	82,867	22,955
Total	3,072,631	72,746
Internal equipment and supplies service: Working Capital Fund	118,762	118,762
Grand total	3,191,393	191,508

1/ Obligations were incurred on a "charged-as-worked" basis.
2/ $550.48 million for suppressing fires in FY 1989, and $22.95 million due to undisclosed obligations as of September 30, 1988.
3/ Includes obligations of $27,724,038 for Reforestation Trust Fund.
4/ K-V = Knutson-Vandenberg Act.

Table 63–Statement of obligations--fiscal years 1985-89

	1989	1988	1987	1986	1985
			Million dollars		
National Forest System	2,747.2	2,254.6	1,967.9	1,718.7	1,849.5
Forest Research	153.1	153.2	143.1	127.9	123.0
State and Private Forestry	89.5	98.7	71.2	66.6	72.0
Human Resource Programs	82.9	83.4	78.1	78.2	73.8
Working Capital Fund	118.7	102.8	90.2	86.9	81.0
Total	3,191.4	2,692.7	2,350.5	2,078.3	2,199.3

Table 64–Distribution of employees by program and occupational category--selected fiscal years 1/

	1989	1988	1987	1986	1980
Research:					
Clerical	470	467	488	501	627
Technical/wage system	1,059	1,029	1,087	1,206	968
Administrative	379	349	302	246	302
Professional	1,317	1,298	1,284	1,240	1,452
Subtotal	3,225	3,143	3,161	3,193	3,349
State and Private Forestry:					
Clerical	91	92	58	46	163
Technical/wage system	148	136	47	46	80
Administrative	54	52	47	27	42
Professional	294	284	119	100	347
Subtotal	587	564	271	219	632
National Forest System:					
Clerical	3,991	4,006	4,121	4,351	6,361
Technical/wage system	25,746	24,928	22,657	23,726	30,036
Administrative	3,672	3,411	3,218	3,104	2,370
Professional	9,770	9,366	9,086	9,014	9,082
Subtotal	43,179	41,711	39,082	40,195	47,849
Total	46,991	45,418	42,514	43,607	51,830
Full-time equivalents 2/	40,912	38,830	36,744	36,918	49,005

1/ For 1988 and 1989, employees in Regional Cooperative Forestry, Forest Pest Management, and Cooperative Fire positions are included in S&PF rather than in NFS, as is shown in previous years.
2/ Full-time equivalent = 2,087 hours of paid employment.

Table 65–Distribution of employees by tour of duty of selected fiscal years 1/

	1989	1988	1987	1986	1980
Permanent full-time	30,467	28,781	27,400	27,419	21,421
Other permanent	2,000	2,118	2,901	3,017	15,815
Temporary	14,524	14,519	15,783	14,121	24,043
Total	46,991	45,418	46,084	44,557	61,279

1/ Beginning with FY 1988, data is reported as of the end of the fiscal year and not as of July, as was done in prior years.

Table 66–Summary of Forest Service Human Resource Programs--fiscal year 1989

	Program funding	Value of work accomplished	Persons served	Percent		Work accomplished 1/	Percent placement	Return per dollar invested
				Women	Minority			
	Million dollars							*Dollars*
Youth Conservation Corps 2/	unfunded	2.4	1,276	43	18	222	-- 3/	1.09
Job Corps 4/	60.4	17.9	8,499	12	46	3,250	93	--
Senior Community Service Employment Program 4/	22.2	34.7	6,148	38	23	2,832	19	1.56
Volunteers in the National Forests 5/	unfunded	29.0	67,356	29	7	2,225	--	--
Hosted programs	unfunded	14.6	12,329	17	40	1,129	--	--
Total	82.6	98.6	95,608	--	--	9,658	--	--

1/ Person years.
2/ Funds were not directly appropriated for Youth Conservation Corps; the Congress earmarked not less than $1 million to be expended from funds available to the Forest Service. We operated a $2.2 million YCC program.
3/ -- = not applicable.
4/ Statistics are for the July 1, 1988, through June 30, 1989, program year.
5/ Statistics include 5,303 Touch America Project (TAP) enrollees.

INDEX

J

L

M

N

O

P

R

S

T

U

V

W

Y

☆U.S. GOVERNMENT PRINTING OFFICE: 1990 258-643/20130